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**Evaluation of Environmental Information Products for Search and Rescue
Optimal Planning System (SAROPS) - Version for Public Release**



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16. Abstract (MAXIMUM 200 WORDS) Search and Rescue (SAR) planning and response activities are sometimes handicapped by the lack of environmental information. Accurate and comprehensive wind and current are necessary to determine the likely movement of search objects over time. To address this, the U.S. Coast Guard has deployed a new software tool for SAR planning, the Search and Rescue Optimal Planning System (SAROPS). SAROPS can use environmental information products with spatially-varying currents and winds, for the recent past, the present, and a few days into the future. Previously, the USCG had not evaluated the merits of the available environmental products to determine which were best suited for USCG use, and whether they adequately covered USCG areas of responsibility. This report provides a snapshot of environmental information products available at the time of the survey and their characteristics. The study team identified 103 products for further evaluation. The evaluation methodology was based on four areas of product attributes. Recommendations for product use in SAROPS are provided in this report. Summaries describing the nature and quality of each product, and the product coverage for each Coast Guard district, are contained in the appendices.					
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EXECUTIVE SUMMARY

The overall efficacy of the U.S. Coast Guard's (USCG) Search and Rescue (SAR) mission has long been compromised by a lack of adequate environmental information. Accurate and comprehensive data on key environmental parameters, such as wind and current speed, is critical to the prediction of search object movements over time. Information that lacks resolution or accuracy will tend to produce a larger search area that does not contain the search object, or is unnecessarily larger. To address this issue, the USCG developed a software tool, the Search and Rescue Operational Planning System (SAROPS) that uses a wide variety of information sources to predict a search object's probable location over time.

One component of SAROPS, the Environmental Data Server (EDS), is operated by the Operations Systems Center (OSC) in Martinsburg, WV. The EDS obtains information from a select group of information sources external to the USCG that provide real-time data for past, present, and future environmental conditions, including time-varying wind speed and direction, current speed and direction, atmospheric and sea conditions, and air and water temperature. SAROPS uses this information to calculate search object locations, to assess crew safety, and to assess the survival times of search victims.

Because the accuracy and precision of SAROPS predictions depends on the completeness and accuracy of data supplied through the EDS, the USCG Office of Search and Rescue (CG-534) requested the Research & Development Center (R&DC) to assess the merits of environmental information used by SAROPS and to identify and assess other available sources of information and their products.

A team of R&DC staff and contractors compiled a list of environmental parameters of potential interest to the USCG (including wind speed and direction; current speed and direction; sea temperature; and air temperature). This list included parameters pertinent to the safety and performance of search and rescue units (SRUs), including wave height and wave direction; precipitation; visibility; and ceiling.

The project team identified specific environmental information products and the information providers through a combination of Internet searches, list-server announcements, and personal contacts with professional peers. The team ranked the products identified using a scoring methodology based on a set of product attributes. Provider responses to an online questionnaire served as the primary source of scoring data.

The study identified 212 environmental data products of note, half of which were either not intended to provide real-time information, or did not address parameters of interest to the USCG. This report provides descriptions of the 103 products applicable to Coast Guard missions and recommends which of these products should be included in the EDS.

The surface-wind fields provided by atmospheric products currently in use by SAROPS (the North American Mesoscale (NAM) Model, for example)—if combined with the National Digital Forecast Database and the newer Fleet Numerical Meteorology and Oceanography Center products—would provide adequate spatial and temporal coverage and resolution for nearly all USCG areas of interest.

The same is not true for spatial coverage and resolution of surface currents. Operational National Oceanic and Atmospheric Administration (NOAA) and Navy oceanographic models that provide current analyses and predictions are suitable for offshore use; however, a

majority of USCG SAR cases occur within 20 nmi of the coast. Other model products that cover coastal areas, such as the Advanced Circulation Model (ADCIRC), do not completely describe surface currents. Regional model product coverage is patchy, and current meter measurements provide limited spatial coverage.

The Regional Associations organized under Ocean.US and the Integrated Ocean Observing System (IOOS) could address the shortage of data in this category. Cooperation among IOOS members is expanding the spatial coverage of coastal, surface current field products. We recommend that the Office of Search and Rescue, and other Coast Guard programs that can benefit from IOOS, specify detailed user needs and propose system improvements concerning reliability, accuracy, and spatial coverage of these systems.

A shortcoming common to both the modeled and measured surface current products is that accuracy in predicting search-target trajectories has not been rigorously examined. We recommend comparative error analyses before products are added to the EDS.

We also recommend incorporation of a climatological “wind-atlas” product to serve as a backup source of wind data when the EDS or the Internet is not available.

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LIST OF ACRONYMS AND ABBREVIATIONS

AASTR	Advanced Along Track Scanning Radiometer
ADCIRC	Advanced Circulation Model
ADCP	Acoustic Doppler Current Profiler
AEF	Accurate Environmental Forecasting
AER	Atmospheric and Environmental Research
AFWA	Air Force Weather Agency
AGU	American Geophysical Union
AMSRE	Advanced Microwave Scanning Radiometer Enhanced
AMSR-E-SIPS	Advanced Microwave Scanning Radiometer Enhanced Science Investigator led Processing System
AOOS	Alaska Ocean Observing System
APDRC	Asia-Pacific Data-Research Center
APL	Applied Physics Laboratory, Johns Hopkins University
ASA	Applied Science Associates
ASIT	Air-Sea Interaction Tower
ATCF	Automated Tropical Cyclone Forecast System
AVHRR	Advanced Very High Resolution Radiometer
AWIPS	Advanced Weather Interactive Processing System
BIS	Block Island Sound
BML	Bodega Marine Laboratory, University of California - Davis
BOON	Bodega Ocean Observing Node
BSRC	Beaches and Shores Resource Center, Florida State University
BUFR	Binary Universal Form for Representation
C	Celsius
C2CEN	Command and Control Engineering Center
CAAPS	Centralized Atmospheric Analysis and Prediction System
CALTECH	California Institute of Technology
CaRA	Caribbean Regional Association
CariCOOS	Caribbean Integrated Coastal Ocean Observing System
Caro-COOPS	Carolinas Coastal Ocean Observing and Prediction System
CASP	Computer Assisted Search Planning
CBI	Conrad Blucher Institute
CBOFS	Chesapeake Bay Operational Forecast System
CBOS	Chesapeake Bay Observing System
CCALMR	Center for Coastal and Land-Margin Research, Oregon Health & Science University
CCAR	Colorado Center for Astrodynamics Research
CCAT	Coastal Circulation and Transport
CCEC	College of Computing Sciences, Engineering and Construction, University of North Florida.
CDC	Climate Diagnostics Center
CDIP	Coastal Data Information Program
CDMO	Centralized Data Management Office
CDO	Command Duty Officer
CeNCOOS	Central and Northern California Ocean Observing System

CG	Coast Guard
CG-534	Coast Guard Office of Search and Rescue
CIMT	Center for Integrated Marine Technology
CIRES	Cooperative Institute for Research in Environmental Sciences
Cm	Centimeter
CMAN	Coastal-Marine Automated Network
CMOP	Coastal Margin Observation and Prediction
CMS	Center for Marine Science, University of North Carolina, Wilmington
COADS	Comprehensive Ocean Atmosphere Data Set
COAMPS	Coupled Ocean/Atmosphere Mesoscale Prediction System
COAPS	Center for Ocean-Atmospheric Prediction Studies
COAS	Oregon State University, College of Oceanic & Atmospheric Sciences
COCMP	Coastal Oceans Currents Monitoring Program
CODAR	Coastal Ocean Dynamic Application Radar
COFDL	Coastal and Ocean Fluid Dynamics Laboratory
COLA	Center for Ocean-Land-Atmosphere Studies
COMPS	Coastal Ocean Monitoring and Prediction System
CONUS	Continental United States
COOL	Coastal Ocean Observing Laboratory
CO-OPS	Center for Operational Oceanographic Products and Services
CORIE	Columbia River Estuary Real-Time Observation and Forecasting System
CORMP	Coastal Ocean Research and Monitoring Program
CREW	Center on Research for Environment and Water
CSDL	Coast Survey Development Laboratory
CSI	Coastal Studies Institute
CZM	coastal zone management
DART	Deep Ocean Assessment and Reporting of Tsunamis
DBOS	Delaware Bay Observing System
DCM	Data Center Marine
DIRTH	Direction Interval Retrieval with Threshold Nudging
DMAC	Data Management and Communication
DMES	Department of Marine & Environmental Systems
DMSP	Defense Meteorological Satellite Program
DoD	Department of Defense
DODS	Distributed Ocean Data System
ECMWF	European Centre for Medium Range Weather Forecasts
EDS	Environmental Data Server
EFDC	Environmental Fluid Dynamics Code
EFSIS	East Florida Shelf Information System
EMC	Environmental Modeling Center
EPWS	Extended Prince William Sound
ERI	Electromagnetic Refractive Index
ESR	Earth & Space Research
FIT	Florida Institute of Technology
FNMOC	Fleet Numerical Meteorology and Oceanography Center

FSU	Florida State University
FTP	File Transfer Protocol
FVCOM	Finite Volume Coastal Ocean Model
GAC	Global Area Coverage
GBOFS	Galveston Bay Operational Forecast System
GCOOS	Gulf of Mexico Coastal Ocean Observing System
GCV	Generalized Cross Validation
GDR	Geophysical Data Record
GFDL	Geophysical Fluid Dynamics Lab
GFI	Government Furnished Information
GFS	Global Forecast System
GHCC	Global Hydrology and Climate Center
GHRC	Global Hydrology Resource Center
GHRST-PP	Global High Resolution Sea Surface Temperature Pilot Project
GIS	Geographic Information System
GLCFS	Great Lakes Coastal Forecasting System
GLERL	Great Lakes Environmental Research Lab
GLOFS	Great Lakes Operational Forecast System
GLOS	Great Lakes Observing System
GODAE	Global Ocean Data Assimilation Experiment
GOES	Geostationary Operational Environmental Satellites
GoMOOS	Gulf of Maine Ocean Observing System
GRIB	Gridded Binary
GSFC	Goddard Space Flight Center
GUI	Graphical User Interface
HDF	Hierarchical Data Format
HF	High Frequency
HTTP	Hypertext Transfer Protocol
HYCOM	HYbrid Coordinate Ocean Model
IASNFS	Intra-Americas Sea Ocean Nowcast/Forecast System
ICON	Innovative Coastal-Ocean Observing Network
IGES	Institute of Global Environment and Society
IMARS	Institute for Marine Remote Sensing
IOOS	Integrated Ocean Observing System
IPRC	International Pacific Research Center
IRD	Research Institute for Development
IRI	International Research Institute
ITWS	Integrated Terminal Weather System
JAWS	Joint Automated Work Sheets
JHU	Johns Hopkins University
JIPS	Joint Industry Projects
JMV	Joint Meteorological and Oceanographic Viewer
JPL	Jet Propulsion Lab, California Institute of Technology
km	Kilometer
LAS	Live Access Server
LDEO	Lamont-Doherty Earth Observatory

LDM	Local Data Manager
LIS	Long Island Sound
LISICOS	Long Island Sound Integrated Coastal Observing System
LOLA	Surflin.com global surface wave model
LSU	Louisiana State University
LUMCON	Louisiana Universities Marine Consortium
m	Meter
MACOORA	Mid-Atlantic Coastal Ocean Observing Regional Association
mb	Millibar
MBARI	Monterey Bay Aquarium Research Institute
MCSST	Multi-channel Sea Surface Temperature
METOC	Meteorological and Oceanographic
MICIS	Midwestern Climate Information System
MODAS	Modular Ocean Data Assimilation System
MODIS	Moderate Resolution Imaging Spectroradiometer
MOOS	Monterey Ocean Observing System
MPO	Meteorology and Physical Oceanography
MRCC	Midwestern Regional Climate Center
MSFC	Marshall Space Flight Center
MSI	University of California - Santa Barbara, Marine Science Institute
MUDH	Multidimensional Histogram
MVCO	Martha's Vineyard Coastal Observatory
NAM	North American Mesoscale Model
NANOOS	Northwest Association of Networked Ocean Observing Systems
NASA	National Aeronautics and Space Administration
NAVOCEANO	Naval Oceanographic Office
NCAR	National Center for Atmospheric Research
NCCOOS	North Carolina Coastal Observing System
NCDC	National Climatic Data Center
NCDDC	National Coastal Data Development Center
NCEP	National Centers for Environmental Prediction
NCODA	Navy Coupled Ocean Data Assimilation
NCOM	Navy Coastal Ocean Model
NDBC	National Data Buoy Center
NDFD	National Digital Forecast Database
NERA	Northeastern Regional Association of Coastal Ocean Observing Systems
NERON	NOAA Environmental Real-Time Observation Network
NERRS	National Estuarine Research Reserve System
NESDIS	National Environmental Satellite, Data, and Information Service
NFS	Nowcast/Forecast System
NGDC	National Geophysical Data Center
NHC	National Hurricane Center
NJSOS	New Jersey Shelf Observing System
NLMOC	Naval Atlantic Meteorology and Oceanography Center
NLOM	Navy Layered Ocean Model

NLSST	Non Linear Sea Surface Temperature
nmi	nautical mile
NOAA	National Oceanic and Atmospheric Administration
NODC	National Oceanographic Data Center
NOF	Normalized Objective Function
NOGAPS	Navy Operational Global Atmospheric Prediction System
NOMADS	NOAA Operational Model Archive and Distribution System
NOPP	National Oceanographic Partnership Program
NOS	National Ocean Service
NPS	Naval Postgraduate School
NRCC	Northeast Regional Climate Center
NRCS	Natural Resources Conservation Service
NRL	Naval Research Laboratory
NSIDC	National Snow and Ice Data Center
NSSFC	National Severe Storms Forecast Center
NSSTC	National Space Science and Technology Center
NVODS	National Virtual Ocean Data System
NWIS	National Water Information System
NWLON	National Water Level Observation Network
NWLP	National Water Level Program
NWP	Numerical Weather Prediction
NWS	National Weather Service
NYHOPS	New York Harbor Observing and Prediction System
NYHOS	New York Harbor Observing System
OCS	Office of Coast Survey
OCSD	Orange County Sanitation District
OGI	Oregon Graduate Institute
OHSU	Oregon Health & Science University
OI	Optimum Interpolation
OOS	ocean observing systems
OPEL/AMP	Ocean Prediction Experimental Laboratory/Applied Marine Physics
OrCOOS	Oregon Coastal Ocean Observing System
OSC	Operations Systems Center
OSCAR	Ocean Surface Current Analyses-Real Time
OSRI	Oil Spill Recovery Institute
OSU	Oregon State University
OWI	Oceanweather Incorporated
PacIOOS	Pacific Regional Integrated Ocean Observing System
PFEL	Pacific Fisheries Environmental Lab
PIW	Person in the water
PMEL	Pacific Marine Environmental Lab
PNG	Portable Network Graphic
PO.DAAC	Physical Oceanography Distributed Active Archive Center
POC	Point of Contact
POM	Princeton Ocean Model
PORTS	Physical Oceanographic Real-Time System

PUFFS	PORTS Uniform Flat File Format
QA/QC	Quality Assurance/Quality Control
R&D	Research and Development
R&DC	Research and Development Center
RA	Regional Association
RAMS	Regional Atmospheric Modeling System
RAP	Research Applications Program
RDI	RD Instruments
RFI	Request for Information
ROFS	Regional Ocean Forecast System
ROMS	Regional Ocean Modeling System
RSMAS	Rosenstiel School of Marine and Atmospheric Sciences, University of Miami
RSS	Remote Sensing System, Inc.
RTA	Real Time Analysis
RTOFS	Real-Time Ocean Forecast System
RUS	Rapid Update Cycle
RWIS	Road Weather Information System
SABSOON	South Atlantic Bight Synoptic Offshore Observational Network
SAIC	Science Applications International Corporation
SALMON	Sea Air Land Modeling and Observing Network
SAR	Search and Rescue
SAROPS	Search and Rescue Optimal Planning System
SCCOOS	Southern California Coastal Ocean Observing System
SCMI	Surface Current Mapping Initiative
SCOOP	Southeastern Coastal Ocean Observing Program
SDCOOS	San Diego Coastal Ocean Observing System
SEACOOS	Southeast Atlantic Coastal Ocean Observing System
SEAKEYS	Florida Keys Seascape
SECOORA	Southeast Coastal Ocean Observing Regional Association
SERA-COOS	Southeast Regional Association for Coastal Ocean Observations. This organization is now SECOORA
SERCC	Southeast Regional Climate Center
SFOS	School of Fisheries and Ocean Sciences, University of Alaska - Fairbanks
SIO	Scripps Institution of Oceanography
SJROFS	St. John's River Operational Forecast System
SKIO	Skidaway Institute of Oceanography, University of Georgia,
SLDMB	Self-locating Datum Marker Buoy
SMBO	Santa Monica Bay Observatory
SMS	School of Marine Sciences, University of Maine
SOS	Sensor observation service
SPC	Storm Prediction Center
SPORT	Short-term Prediction Research and Transition Center
SQL	Structured Query Language
SRCC	Southern Regional Climate Center

SRU	Search and Rescue Unit
SSD	Satellite Services Division
SSM/I	Special Sensor Microwave Imager
SST	Sea Surface Temperature
SURA	Southeastern Universities Research Association
SWAN	Simulating Waves in the Nearshore
SWMP	System-Wide Monitoring Program
TABS	Texas Automated Buoy System
TCOON	Texas Coastal Ocean Observation Network
TEDS	Tactical Environmental Data Server
TGLO	Texas General Land Office
TMI	Microwave Imager
TOPS	Thermal Ocean Prediction System
TRMM	Tropical Rainfall Measuring Mission
UAF	University of Alaska – Fairbanks
UCAR/NCAR	University Corporation / National Center for Atmospheric Research
UCLA	University of California, Los Angeles
UCSB	University of California, Santa Barbara
UCSD	University of California, San Diego
UGA	University of Georgia
UM	University of Miami
UMCES	University of Maryland, Center for Environmental Studies
UNC	University of North Carolina
UNCW	University of North Carolina, Wilmington
UNF	University of North Florida
UPR-MC	University of Puerto Rico Mayaguez Campus
USAF	U.S. Air Force
USC	University of Southern California or University of South Carolina
USCG	United States Coast Guard
USGS	United States Geological Survey
USN	United States Navy
USNO	United States Naval Observatory
VIMS	Virginia Institute of Marine Science, College of William and Mary
WAM	Wave Model
WAVCIS	Wave-Current-Surge Information System
WERA	Wellen Radar
WFS	West Florida Shelf
WHOI	Woods Hole Oceanographic Institution
WMS	Web Mapping Service
WRCC	Western Regional Climate Center
WRF	Weather Research and Forecasting
WW3	Wave Watch III

1. INTRODUCTION

Search and Rescue (SAR) is a primary mission of the U.S. Coast Guard (USCG). In order to accomplish this mission effectively, USCG search and rescue planners need to accurately project the position of search objects over time.

In the past, SAR planners used manual calculations and computer simulations to project search-object positions. For manual calculations, they used the Joint Automated Work Sheets (JAWS) system; for computer simulations, they used Computer Assisted Search Planning (CASP) system. The CASP system used wind and current data that were applied every 12 hours to a 1-degree latitude/longitude grid. (More-detailed current data were used for the Gulf Stream and Florida Current. For other areas, current data consisted of monthly-averaged values.) The JAWS system used one wind and current value over the entire duration of a SAR case.

The inability of the JAWS and CASP systems to handle spatially-varying data has been solved in the CG's new software tool, SAROPS. SAROPS allows SAR planners to base missions on high-resolution, temporally and spatially-varying wind and current information, and also on other environmental information such as sea surface temperature, air temperature, visibility, and wave height.

The SAROPS system consists of three functional components: (1) a mapping environment with a graphical user interface (GUI) extension; (2) a search and rescue planning, trajectory simulation and resource allocation module (SAR Tools extension); and (3) an environmental data server (EDS) that collects and stores environmental information from selected sources worldwide. The first two components are installed on local servers near command centers throughout the country; the EDS is located at the Coast Guard Operations Systems Center (OSC) in Martinsburg, WV.

Watchstanders run SAROPS at USCG command centers nationwide. The local servers request environmental data, as needed, from the EDS, which accesses a catalog of information products collected from external modeling and observational systems.

Table 1 lists the wind and current products presently available to SAROPS through the EDS. As individual product names indicate, some of these products are focused on large spatial scales, including global. The global products are not generally suited for use near the coast where the majority of SAR cases occur. There are, however, other information products that are potentially well suited for inshore use. In fact, some of these products, available from a variety of sources, are currently used by SAR watchstanders, but not "automatically" through the SAROPS EDS.

In order to take advantage of the availability of environmental information products, the U.S. Coast Guard Office of Search and Rescue (CG-534) requested the Research and Development Center (R&DC) to identify and evaluate these products for possible inclusion in SAROPS. The specific goal was to provide the CG-534 program manager, as well as command-center watchstanders, with a prioritized inventory of environmental information products for use in specific areas of interest, and to enable regional SAR planners to make better-informed decisions concerning which products they should rely on when planning and executing specific search cases.

Table 1. Wind and current products presently available to SAROPS.

Winds	Currents
U. S. Navy FNMOC Global 1° model	Navy FNMOC CASP currents
NOAA NCEP GFS (Global Forecast System)	NAVOCEANO Global NCOM
NOAA NCEP NAM (North American Mesoscale)	NOAA NCEP HYCOM (Hybrid Coordinate Ocean Model)
NOAA GLERL/NOS Great Lakes winds	ADCIRC East and West
NOAA NDBC buoys & CMAN stations	Aggregated NCOM + ADCIRC
	NOAA GLERL/NOS Great Lakes currents
	Mariano Global Surface Velocity Analysis (MGSVA)
	Florida Current Static Data File

This report identifies and evaluates 103 information products potentially useful for SAROPS (and other USCG uses), and indicates those *best* suited for SAROPS. The report also describes the methodology used to identify and evaluate the identified information products, provides the results of the evaluations, and makes recommendations concerning further work.

The search identified the 212 products listed in Appendix A. Of this group, the 103 products described in Appendix B were considered to be compatible with CG needs. Appendix C provides a comprehensive listing of products available for each USCG district and area, sorted by parameter. Appendix D catalogs product availability by parameter.

2. METHODOLOGY

In this report, a ‘product’ is a set of environmental data maintained by a provider (such as a university, government agency, or commercial concern) and made available to users through a readily accessible medium, usually through the Web.

The project team used the following five steps to identify and evaluate environmental information products:

1. The oceanographic and atmospheric parameters needed for SAR planning and execution were identified. These parameters include surface current speed and direction, wave height, sea surface temperature, wind speed and direction, and air temperature.
2. Identify and collect information on the available products that provide these parameters. Most products were identified through Internet searches and message postings. Product providers identified by the project team were contacted and requested to supply information about their products.

3. Develop a set of attributes (evaluation criteria) for determining the value (numerical score) of each information product. Four categories of information product attributes were identified: (1) Operational Status; (2) Access; (3) Domain, Applicability, and Resolution; and (4) Quality.
4. Develop a scoring methodology. Individual attributes within each attribute category were assigned a numerical value. These values were then summed within a category, and the sum was weighted to reflect a greater intrinsic value of certain categories relative to USCG needs.
5. Evaluate all products for which sufficient information was available. The project team applied the methodology developed in Step 4 to obtain a numerical score for each information product. The score for each product (not included in this report) was used to define its value for SAR planning needs and incorporation into SAROPS.

2.1 Environmental Parameters

The environmental parameters of interest are oceanographic and atmospheric properties that affect SAR planning and execution. These properties include surface current speed and direction, wave height, sea surface temperature, and wind speed and direction.

SAR planning includes predicting the probable location of a search object, assessing probability of victim survival, and selecting the proper Search and Rescue units (SRUs). The probable location of a search object is a function of such environmental factors as sea-surface current and wind speed and direction. Victim survival depends on such factors as air and sea surface temperature, wind speed, and relative humidity. Environmental conditions such as visibility, cloud cover, and wave height influence the choice of search patterns and SRUs.

To identify the parameters of interest to SAR, the project team started with a preliminary list of parameters provided by R&DC staff. The list was reviewed by USCG operational experts, oceanographers, and meteorologists, and was expanded to include other environmental parameters expected to be useful for SAR mission planning, as well as for other USCG missions. The new list was then reviewed by subject matter experts in the SAR community.

Table 2 provides a complete list of the oceanographic and atmospheric parameters selected for the evaluation.

Table 2. Oceanographic and atmospheric environmental parameters selected.

Oceanographic	Atmospheric
Currents – sea surface/subsurface	Air temperature
Ice cover	Air temperature daily max/min
Ice thickness	Area forecast information
Ice type	Atmospheric pressure
River discharge	Ceiling
Salinity	Cloud layers
Temperature – sea surface/subsurface	Dew point temperature
Turbidity	Electromagnetic refractive index
Turbulent dispersion coefficient	Icing/freezing layer
Turbulent kinetic energy	Icing potential
Turbulent velocity variance	Precipitation type/rate
Water level – tides and meteorological	Relative humidity
Wave – direction (sea/swell)	Summary of current meteorological conditions
Wave – maximum height	Surface wind speed / gusts
Wave – peak period (sea/swell)	Total cloud cover
Wave – significant height (sea/swell)	Visibility
White cap probability	Weather type
	Wind chill
	Wind stress
	Wind turbulent kinetic energy
	Winds at altitude

2.2 Provider Search

Once the parameter list was established, the team conducted a search to identify agencies, institutions, and commercial entities involved in modeling, observing, and/or disseminating information on coastal and/or offshore environmental conditions. The search combined passive methods such as Internet and literature searches with active methods, such as placing announcements in print and Internet-based newsletters, posting a Request for Information (RFI), and making personal contact with professional peers.

Reports from previous environmental information workshops were reviewed to identify additional providers and products. These reviews identified products from the Naval Oceanographic Office (NAVOCEANO); NOAA/National Centers for Environmental Prediction (NCEP); NOAA/National Weather Service (NWS); and NOAA/National Ocean Service (NOS).

In addition, the R&DC asked SAR specialists from various Coast Guard Districts to provide lists of data providers and products they consider or use in SAR planning.

To reach providers not already identified, the project team posted an advertisement in *Eos*, the American Geophysical Union's (AGU's) weekly publication. This ad requested providers of

meteorological and oceanographic information data to fill out a survey at a project-specific Web site. The ad posting produced three additional sources.

The project team also located data providers on the Internet by keyword searches. Web sites of known information providers, such as the Integrated Ocean Observing System (IOOS) regional associations, were reviewed to identify references to other providers.

The R&DC project manager sent an e-mail notice to 100 points of contact representing 11 government agencies, 12 regional association-related organizations, 33 universities/research centers, 9 commercial providers, and 4 international organizations. The recipients were asked to complete an online survey. To identify any additional potential candidates, a similar e-mail notice was sent to the University of Delaware's coastal list, a moderated e-mail list for coastal engineers and scientists. An RFI was also posted in FEDBIZOPPS to expand the receiving audience to the Federal contracting community. FEDBIZOPPS is the Internet portal that advertises Federal government procurement opportunities.

Appendix A lists the 212 products that were initially identified, sorted by organization type: U.S. government agency, IOOS regional association, universities/research center, commercial provider, and international agency.

Some providers identified during the preliminary search process were removed from consideration for one or more of the following reasons: their products were not applicable to USCG use; their system provided information that was not sufficiently current; their system was not operational; their Web site was a link or "pass-through" from another data provider already identified; or the point of contact could not be reached. These providers are listed in Table A-5.

2.3 Numerical Product Scoring

The evaluation used a quantitative approach to identify products better suited for Coast Guard Search and Rescue (SAR) and operational planning. This approach was one factor used in making product recommendations.

The contractor first established a preliminary list of product attributes. Attributes are defined as characteristics of information products, such as time step, spatial resolution, operational redundancy, or quality assurance checks that provide insight to a product's suitability for use in SAR and other Coast Guard operations. The list was validated through a trial evaluation on a subset of products.

The team decided that the attributes could be grouped into the four categories shown in Table 3: (1) Operational Status attributes, which address how an information product is made available consistent with the needs of operational product users; (2) Access attributes, which address ease of access to an available product; (3) Domain, Applicability, and Resolution attributes, which address the product's ability to resolve spatial and temporal features of a parameter in the area of interest to meet SAR planning needs; and (4) Quality attributes, which identify product suitability based on initial validation and ongoing checks to ensure that the product is providing correct information on a continuing basis.

Product attribute information was collected via an on-line questionnaire that was completed by the point of contact for each product. The questions were grouped according to their applicable category. Answers were entered into the database and scored by the questionnaire software at the time of entry. Some providers elected to respond using a downloadable document version of

the survey. Responses sent to the R&DC were entered into the database manually (and scored at that time).

The questionnaire posed questions that allowed for either multiple choice or “yes/no” answers. The questions and possible answers are shown in Table 4 through Table 7. The scores assigned to answers will not be released by the Coast Guard; however, the answers in the tables are listed in order of decreasing score. Individual questions within a category were weighted differently to reflect the team’s judgment of their relative importance (for internal Coast Guard use) relative to other attributes in the category. For example, the team decided that the weighting of attribute (1): “Is the product presently available 24/365 in electronic format?” would be higher than that for attribute (3): “Is there a usage fee?”

For attribute 5 in Table 4, and for the attributes in Table 5, the number of ‘yes’ answers to the statements are summed to provide a score for that attribute. Again, the scores assigned to the number of “yes” answers are for internal Coast Guard use and will not be released.

The final product scores included category weightings that reflected the significance of the category to the Coast Guard. The category weightings are shown in the rightmost column in Table 3. The Operational Status and Data Quality categories were assigned the highest scores.

The Coast Guard has decided to retain the scoring information and results for its internal decision-making. The remaining information on each product and the Coast Guard’s appraisal are considered to be of public interest and are presented at the end of the report and in Appendix B.

Table 3. Product attributes, applicability by product type, and maximum category scores.

Attributes by Category	Applicability (Models/ Observations)	Category Weighting
Operational Status		35
1. General	Both	
2. Availability of technical support (24/7/365)	Both	
3. Observation data time lag	Observations	
4. Forecasting cycle	Models	
5. Reliability	Both	
6. System data distribution infrastructure redundancy	Both	
Access		16
1. Are products presently available 24/7 in electronic format?	Both	
2. Are archived data available on-line?	Both	
3. Is there a usage fee?	Both	
Domain, Applicability and Resolution		24
1. Vertical resolution	Both	
2. Horizontal resolution	Both	
3. Time Step	Both	
Data Quality		25
<i>Observation data products</i>		
1. Are uncertainty or error estimates available?	Observations	
2. Are automated real-time quality tests performed?	Observations	
3. Is real-time data quality flagging performed?	Observations	
4. Extent of ongoing sensor calibrations	Observations	
5. Are automated procedures manually checked?	Observations	
6. Is an individual assigned QA/QC responsibility?	Observations	
<i>Model products</i>		
7. Is data assimilation routinely performed?	Models	
8. Are nowcast/analysis products provided with data assimilation?	Models	
9. Has the model been calibrated or validated?	Models	
10. Is model output routinely checked against observation data?	Models	
11. Are uncertainty/error estimates routinely provided with model results?	Models	
12. Is the model formulation and application published in peer-reviewed literature?	Models	
Total		100

Table 4. Operational status attributes and criteria.

Attributes and Answer Hierarchy	
1. General	
Product has been supporting a variety of clients with operational (must-have now) needs.	
Data are regularly available but the provider is not required or funded to support “must have” operational users.	
Not operational	
2. Availability of Technical Support (24/365)	
24 hr/day, 365 days/year	
12 hr/day, 365 days/year	
12 hr/weekday, 250 working days	
8 hr/weekday, 250 working days	
Less than 8 hr/weekday, 250 working days	
3a. Observation data time lag	
Less than or equal to 30 minutes	
Less than or equal to 1 hour	
Less than 6 hours	
Greater than or equal to 6 hours	
3b. Forecasting cycle (models only)	
≥ 2 day forecast at ≤ 6 hour intervals, or Nowcast, every 6 to less than 24 hours	
≥ 2 day forecast every 6 to less than 24 hours	
1 or 2 day forecast ≥ 24 hours	
4. Reliability (percent of the past year the product has been available)	
Greater than 99%	
Greater than 95%	
Greater than 90%	
Less than or equal to 90%	
5. System data distribution infrastructure redundancy (Sum the number of the following that apply)	
System has redundant Web/data servers	
System has redundant Internet access	
System has a collocated data center with independent capabilities	
System has an independent power supply	

Table 5. Access attributes and criteria.

Attributes and Answer Hierarchy
1. Are products presently available 24/365 in electronic format?
Yes
Planned in the next 12 months
No
2. Are archived data available on-line?
Greater than or equal to 1 week available on-line
Less than 1 week available on-line
No on-line archive available
3. Is there a usage fee?
No Costs
Costs/Fees

Table 6. Domain, applicability, and resolution attributes and criteria.

Attributes and Answer Hierarchy
1. Vertical resolution (measurement depth or model surface element thickness)
(a) Oceanographic
Depth or thickness is within 1 m of ocean surface
Depth or thickness is within 5 m of ocean surface
Depth or thickness is greater than 5 m
(b) Meteorological
Surface value is measured at or adjusted to 10 m
Surface value is measured at or adjusted a height greater than 10 m
2. Horizontal resolution (applies to gridded meteorological and gridded oceanographic data only)
(a) Offshore grid spacing
Less than or equal to 20 km
Greater than 20 km to less than 50 km
Greater than 50 km to less than 100 km
Greater than or equal to 100 km
(b) Inshore (within 20 nmi of coast) grid spacing
Less than 5 km
Greater than 5 km to less than 10 km
10 km to less than 20 km
Greater than or equal to 20 km
3. Time step (Model or observational data)
Less than 1 hour
Greater than or equal to 1 hour to less than 3 hours
Greater than or equal to 3 hour to less than 6 hours
Greater than or equal to 6 hours

Table 7. Data quality attributes and criteria.

Attributes and Answer Hierarchy (Positive answers are summed to produce score)	
1a. QC/QA Process Data Acquisition (Observations)	
Uncertainty or error estimates are provided with the data.	
All observations are subjected to automated real-time data quality tests (e.g., range checking).	
The real-time data quality is described by an aggregate quality flag (a simple overall descriptor) and a detailed quality test record (indicative of the results of any individual quality tests applied) to suit both the common user and the real-time scientist. Example: -9 = missing value 0 = quality not evaluated 1 = bad 2 = questionable/suspect 3 = good	
Sensors are independently verified or calibrated at routine intervals.	
Manual checks on the automated procedures, the real-time data that have been collected, and the status of the observing system are performed and provided on a time scale appropriate to ensure the integrity of the observing system	
An individual is assigned responsibility for the QA/QC process.	
1b. Model Skill	
The model performs data assimilation with real-time data on a daily (or model forecast-cycle) basis.	
The model provides a nowcast/analysis product with data assimilation.	
The model has been calibrated and validated with observation data.	
Model results are checked against observations as part of an on-going process.	
Uncertainty or error estimates are provided with the model results.	
Model formulation and application have been published in a peer-reviewed publication.	

3. FINDINGS

3.1 Product Source

This study evaluated 212 individual environmental information products for possible USCG use. These products are made available by a wide range of organizations, from federal and state agencies, to universities, to non-profit agencies, to private companies. (Refer to Appendix A for a complete listing.)

The project team found that identifying the original sources of these products was often difficult, because information products tend to be shared freely between entities linked through a network of funding and cooperative liaisons. In fact, the team found that nearly all of the information products it identified could be obtained from multiple sites/providers. As best possible, this report identifies and evaluates the source most directly responsible for collecting, processing, or synthesizing environmental information.

Two initiatives central to the cooperative nature and cross-linking of information on the Internet are described below: (1) the Integrated Ocean Observing System (IOOS) and the regional observing associations, and (2) the Southeastern Universities Research Association (SURA).

3.1.1 IOOS and the Regional Observing Associations

Several university-affiliated providers of real-time observing or modeling products participate in regional associations that are generally affiliated with IOOS. These providers are funded by a variety of sources. A significant funding source has been the National Oceanographic Partnership Program (NOPP), which is a collaboration of 15 federal agencies created by statute, chaired by the U.S. Navy, to coordinate national oceanographic research and education initiatives. NOPP's goal is to advance national goals in the areas of security, economic development, quality-of-life protection, science education, and communication.

In 2000, NOPP created Ocean.US to coordinate development of IOOS as the U.S. component of an international Global Ocean Observing System (GOOS). According to the Ocean.US.Web site, IOOS is "a system of systems that routinely and continuously provides quality-controlled data and information on current and future states of the oceans and Great Lakes, from the global scale of ocean basins to local scales of coastal ecosystems. It is a multidisciplinary system designed to provide data in forms and at rates required by decision makers to address seven societal goals."

IOOS created 11 regional associations (RAs) to address priorities and to engage stakeholders at the local and regional levels. The RAs are composed of member institutions and groups (sub-RAs) that cover smaller regions and individual systems. The RAs coordinate the development of regional coastal ocean-observing systems and collaborate with federal agencies to help guide overall IOOS development.

Many of the RAs that perform environmental monitoring responded to the R&DC inquiries. The data from each RA, or its affiliated institutions, was typically reported on affiliated sites, because all monitoring activities are networked, and information is freely exchanged. The managers of these systems typically share information with as many other organizations as possible in order to maximize their exposure and demonstrate the value of their system. In cases where the funding agency was a federal organization – such as NOAA/Physical Oceanographic Real-Time

System (PORTS); NOAA/National Data Buoy Center (NDBC); or a NOAA/National Estuarine Research Reserve System (NERRS) reserve – the data was also reported by that organization.

The 11 RAs are described below. In addition, their participating organizations (not including the nationwide monitoring programs, such as NOAA's NDBC, PORTS, and NERRS) are outlined to help USCG users understand why information collected by a particular monitoring entity would be reported on a number of other sites:

- Northeastern Regional Association of Coastal Ocean Observing Systems (NERA)
NERA covers the area from the Gulf of Maine, extending into Canada, south into Block Island Sound. NERA's principal sub-RA is the Gulf of Maine Ocean Observing System (GoMOOS). Other participating organizations include the Woods Hole Oceanographic Institution's Martha's Vineyard Coastal Observatory (MVCO), the University of New Hampshire's Coastal Ocean Observing Center, and the University of Connecticut's Long Island Sound Coastal Observatory (LISICOS).
- Mid-Atlantic Coastal Ocean Observing Regional Association (MACOORA)
MACOORA covers the area between Provincetown on Cape Cod and Cape Hatteras. Along with the federal observing entities having national coverage, MACOORA's Web site lists the following sub-RAs:
 - Woods Hole Oceanographic Institution's MVCO
 - University of Connecticut's LISICOS
 - New York Harbor Observing System (NYHOS)
 - Rutgers University's Coastal Ocean Observation Lab (COOL) CODAR
 - New Jersey Shelf Observing System (NJSOS), which is a part of the Rutgers Coastal Ocean Observing Laboratory (COOL)
 - Delaware Bay Observing System (DBOS)
 - Chesapeake Bay Observing System (CBOS)
- Southeast Coastal Ocean Observations Regional Association (SECOORA)
SECOORA covers the area between North Carolina and the Atlantic and Gulf Coast waters of Florida. SECOORA was formerly known as SERA-COOS (Southeast Regional Association for Coastal Ocean Observations). SECOORA and SEACOOS (mentioned below) had the greatest number of sub-RAs, including:
 - North Carolina Coastal Ocean Observing System (NCCOOS)
 - Coastal Ocean Research and Monitoring Program (CORMP)
 - Carolinas Coastal Ocean Observing and Prediction System (Caro-COOPS)
 - South Atlantic Bight Synoptic Offshore Observational Network (SABSOON)
 - East Florida Shelf Information System (EFSIS)
 - Florida Keys Seascape (SEAKEYS) Program
 - West Florida Coastal Ocean Monitoring and Prediction System (COMPS)

The Southeast Atlantic Coastal Ocean Observing System (SEACOOS) was formed as a prototypical RA, with National Science Foundation (NSF) funding, by five universities in 2001. Although SEACOOS has no formal relationship with SECOORA, its geographic area is identical, and many of its participants are also active in SECOORA. In the long term, SECOORA will replace, and expand on, the capabilities and functions of SEACOOS.

- Gulf of Mexico Coastal Ocean Observing System (GCOOS)
GCOOS covers the West Coast of Florida through Texas. Participants in GCOOS include the following university-based programs:
 - West Florida Coastal Ocean Monitoring and Prediction System (COMPS)
 - Louisiana Universities Marine Consortium (LUMCON)
 - Texas Automated Buoy System (TABS)
 - Texas Coastal Ocean Observing Network (TCOON)
 - Wave Current Surge Information System (WAVCIS)
- Great Lakes Observing System (GLOS)
GLOS is composed largely of Canadian and U.S. federal and university centers. It does not have any smaller affiliated sub-RAs.
- Caribbean Regional Association (CaRA)
CaRA covers the northeastern Caribbean region, and is associated with the Caribbean Integrated Coastal Observing System (CariCOOS) sub-RA. NOAA is the principal participating federal agency; however, additional measurements (not pertinent for SAR) are maintained by the Department of Marine Sciences of the University of Puerto Rico Mayagüez Campus (UPR-MC), approximately 22 nautical miles off the southwestern coast of Puerto Rico.
- Pacific Regional Integrated Ocean Observing System (PacIOOS)
The PacIOOS region covers the State of Hawaii, Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands, as well as the U.S.-affiliated Pacific Islands, which include the Federated States of Micronesia, the Republic of Palau, and the Republic of the Marshall Islands. NOAA is the principal participating federal agency.
- Southern California Coastal Ocean Observing System (SCCOOS)
SCCOOS covers the southern California coast between adjacent areas of Mexico, north to the Morro Bay area. Monitoring activities are performed by University of California campuses at San Diego (UCSD), Los Angeles (UCLA), Santa Barbara (UCSB), and San Luis Obispo; and also by the University of Southern California (USC). The Orange County Sanitation District (OCSD) also contributes data.

Two identified sub-RAs are the Santa Monica Bay observatory (SMBO), operated by UCLA, and the San Diego Coastal Ocean Observing system (SDCOOS), and operated by UCSD's Scripps Institution of Oceanography (SIO). UCSD also operates the Coastal Data Information Program (CDIP) which distributes observations and wind model data created by the Jet Propulsion Lab (JPL) COAMPS model through SCCOOS. Finally, SIO serves a data-management role and publishes data on the SCCOOS Web site.

The SCCOOS site also mentions the Coastal Ocean Currents Monitoring Program (COCMP). COCMP is an umbrella organization for High Frequency (HF) radar-operators in California. Data collected by COCMP participants is available from SIO.

- Central and Northern California Ocean Observing System (CeNCOOS)
CeNCOOS covers the waters of California from Point Conception north to the Oregon border. Bays and estuaries in this region are also covered by CeNCOOS. Monitoring activities are principally performed by University of California regional campuses, but include the Naval Postgraduate School (NPS), and the Monterey Bay Aquarium Research Institute (MBARI). Participants in CeNCOOS include the following university-based programs:
 - Bodega Ocean Observing Node (BOON)
 - Center for Integrated Marine Technology (CIMT)
 - Coastal Data Information Program (CDIP)
 - Coastal Ocean Currents Monitoring Program (COCMP)
 - The MBARI Monterey Ocean Observing System (MOOS)

The HF radar systems in the CeNCOOS region are included under the COCMP umbrella; therefore, data collected by CeNCOOS members is available from SIO.

- Northwest Association of Networked Ocean Observing Systems (NANOOS)
NANOOS covers the Washington, Oregon, and northern California region, and has links to programs in British Columbia. NANOOS's participating universities include the University of Washington, Oregon State University, and the Oregon Health and Science University. Projects associated with NANOOS include the Columbia River Estuary Real-Time Observation and Forecasting System (CORIE), and the Oregon Coastal Ocean Observing System (OrCOOS).
- Alaska Ocean Observing System (AOOS)
AOOS is the umbrella regional association for Alaska regional observing networks in the Gulf of Alaska, the Bering Sea/Aleutian Islands, Prince William Sound, Cook Inlet, and the Arctic Ocean. Data for this region are largely collected by federal agencies, such as NOAA, and state agencies, such as the Road Weather Information System (RWIS). The Sea-Air-Land Modeling and Observing Network (SALMON) Project at the University of Alaska in Fairbanks has mapped surface currents using HF radar in the Beaufort Sea, Cook Inlet, the Gulf of Alaska, and Prince William Sound.

3.1.2 Southeastern Universities Research Association (SURA)

SURA resembles the RAs, but is not directly associated with Ocean.US. According to its Web site, SURA is a nonprofit consortium of more than 60 American universities, established in 1980 to foster collaboration among its member institutions in science and engineering, and to encourage new ideas for collaboration.

One of SURA's initiatives is the SURA Coastal Ocean Observing and Prediction (SCOOP) Program. The purpose of SCOOP is to promote effective and rapid fusion of observed oceanographic data with numerical models, and to facilitate the dissemination information to operational, scientific, and public or private users.

The Web site (<http://www.OpenIOOS.org>) serves as a public interface for SCOOP data and model products. It displays a map of real-time sea surface temperatures for North America, and contains a link to an interactive map of North America that allows users to view several sub-

regions: the Gulf of Maine, the Southeast Atlantic, the Gulf of Mexico, the Caribbean, the Pacific Northwest, Alaska, and the Great Lakes. Layers provide satellite imagery; information on water levels (from NOAA and UNC) and wave heights (from NDBC buoys); and models of ocean currents (from UNC) and of waves (from LSU). SCOOP's value for the USCG and the EDS would be to serve as a single site for accessing the information generated by, and available from, its member organizations.

3.2 Implications of Product Technologies

The project team decided that the technology used to observe and derive a particular product tends to determine the specific product's usefulness for SAR planning and execution, and incorporation in SAROPS. The technology categories and their implications for SAROPS use are discussed below.

- Satellite Observations

A significant percentage of the products identified in this study derive data from satellite observations. These products tend to provide large-scale representations of such oceanographic and atmospheric properties as sea surface temperature, chlorophyll density, or sea-surface roughness.

Some parameters of interest to the USCG, such as wind speed and surface currents, can be estimated from surface roughness; however, the project team found that in many cases data derived from satellite observations was a day old by the time it became available. In addition, the spatial extent of the data was not consistent between subsequent observations. These features are not compatible with the data needs of SAROPS.

Satellite-derived products might be useful in hindcasting situations: that is, for confirming previous model predictions of surface winds or surface currents. In addition, they are useful as sources for sea surface temperature where temperature varies slowly over time. Many are not well suited for direct use in SAR operations in coastal areas.

While the technology used for satellite observations produces gridded data fields needed in SAROPS, many satellite-derived sources were removed from further evaluation because their time step, time delay, and inconsistent spatial coverage made them less suitable relative to other sources.

- In Situ Observations

Another significant percentage of the products identified in this study derive data from in situ observations. In situ observations are direct measurements of parameters at specific locations; for example, wind speed and direction measurements at airport weather stations.

Networks of in situ measurements can provide observations on a synoptic (regional) level; however, only the meteorological observation networks, and a few of the oceanographic observation systems, can be considered synoptic. The technology produces data that are evenly spaced in time, of good quality, and representative of local values. In addition, in-situ data are generally produced with minimal time lag; however, SAROPS is presently not set up to efficiently process time series that are geographically scattered. Irregular measurement distribution in space and the absence of predictions presently put in-situ observations at a disadvantage for SAROPS use.

The present best use of the in situ measurements is for ground-truthing model predictions in a specific area, or to know what exactly is happening at a specific location at a specific time. Data from these measurements might be used directly for checking drift predictions from SAROPS, as well as for operational support; for example, determining the state of tidal or sea conditions. If the area of interest has multiple in-situ measurements that provide a broader regional view of the environmental conditions, the value of the product is enhanced.

Data from NDBC and Weatherflow, which centrally collect and distribute data, would be more easily integrated into SAROPS, because the locations these information sources monitor remain relatively stable over time.

- Coastal High Frequency (HF) Radar Network Observations

Coastal HF radar networks provide two-dimensional maps of sea-surface currents (among other products) across a wide area of the ocean by measuring the Doppler shift of short-period ocean waves in the area covered. Many systems presently under development have experienced quality and coverage issues, but the networks appear to be focused on resolving these problems. Specifically, considerable progress in the expansion of HF radar coverages was already visible during the course of this study.

Also, the spatial and temporal coverage of these systems has been found to vary with environmental conditions. For example, HF radar systems reportedly do not work well when seas are calm. The development of standard data protocols and quality-assurance/quality-control techniques would be beneficial to SAROPS integration.

- Meteorological and Oceanographic Models

The study identified a number of model-derived products produced by universities and federal-government activities for a wide range of purposes. These models provide consistent time and space coverage for many oceanographic and meteorological parameters of interest to the USCG.

The coverage and value of a particular model product was found to vary with its intended use. Many university model applications tend to have a research focus that is not yet entirely consistent with USCG needs. Models operated by federal agencies tend to have an operational focus; these include meteorological and ocean models run by the National Weather Service (NWS) and by the U.S. Navy.

Most models run by federal agencies such as the NWS and the U.S. Navy have a spatial domain that is continental or global. The large-domain models (e.g., GFS, NOGAPS, and NCOM) resolve winds or currents too sparsely to adequately represent winds and ocean circulation in the coastal areas where most SAR cases occur. Higher-resolution regional meteorological models (NAM, NDFD) are appropriate for coastal areas. Higher-resolution coastal circulation models exist (such as the New York Harbor model), but only a few are presently in operation. Many nearshore areas for which the USCG has SAR responsibility are not adequately represented by high-resolution surface current models.

Many model products include an analysis or nowcast product that provides an improved view of present conditions in an area by blending observation data into the model output. Some models additionally use data-assimilation techniques to improve forecasts by way of incorporating observation data.

Model and observational products have inherent differences that make their relative values difficult to compare. An observing system cannot provide forecasts; observational data are generally very sparsely distributed spatially (over sea surface, for example); and many existing models provide data that do not adequately represent most inshore areas. On the other hand, observing networks can readily characterize the inshore areas; synoptic observations also provide a quality check of model performance, offshore as well as along the coast. These differences indicate that models and observations should be viewed as complementary sources of information.

3.3 General Findings

Table 8 summarizes the results of this study. Rows in the table that are shaded light blue indicate RAs.

Table 8. Product-evaluation result summary.

Appendix B page number (Product Summary Sheet)	Organization	Product Name	Product Type	Wind Speed	Currents	Sea Surface Temperature	Air Temperature	Wave Properties	Operational meteorological properties (Cloud cover, ceiling, visibility, etc)	Other oceanographic (Tide Height, River discharge, salinity, etc.)	Operational	Gridded Product	Satellite Product	Available from central distributor, Yes/Partially	Recommended	Conditionally recommended	Not Recommended
B-3	AOOS	Observing System	D		✓	✓		✓		✓	Y	P		Y			☒
B-5	ASA	Regional Tidal Constituent Models	M		✓							Y				☒	
B-7	JPL	QuikSCAT Reduced Merged GDR	D	✓							Y	Y	Y				☒
B-9	JPL	Ocean Surface Current	M		✓	✓				✓		Y	Y				☒
B-11	JPL	Ocean Wind	M	✓			✓					Y	Y			☒	
B-13	VIMS	Observing System	D		✓	✓		✓		✓	Y		Y				☒
B-15	ESR	OSCAR	M		✓							Y	Y				☒
B-17	FIT	Observing System	D		✓	✓		✓		✓							☒
B-19	FSU,COAPS	FSU QuikSCAT Objective Gridded Winds	D	✓							Y	Y	Y				☒
B-21	GeoLogics Corporation	GODAE GHRSS-PP	D			✓					Y	Y	Y		☒		
B-23	Horizon Marine, Inc.	Eddy Watch – Observing System	D		✓						Y					☒	
B-25	JHU APL	Ocean Marine Wind	D	✓							Y	Y	Y				☒
B-27	JHU APL	Sea Surface Temperature	D			✓						Y	Y				☒
B-29	LSU, Coastal Studies Institute	WAVCIS	D		✓	✓		✓		✓	Y			P		☒	
B-31	Mercator-Ocean	Mercator Ocean Forecasts	M		✓	✓					Y	Y				☒	
B-33	NASA MSFC	Sea Ice	D									Y	Y				☒
B-35	NASA MSFC	Sea Surface Temperature	D			✓						Y	Y			☒	
B-37	NOAA/NESDIS	NCDC Meteorological Modeled (NCEP)	M	✓			✓		✓			Y					☒
B-39	NOAA/NESDIS	NCDC Observed Meteorological	D	✓			✓		✓								☒

Table 8. Product evaluation result summary (cont).

Appendix B page number (Product Summary Sheet)	Organization	Product Name	Product Type	Wind Speed	Currents	Sea Surface Temperature	Air Temperature	Wave Properties	Operational meteorological properties (Cloud cover, ceiling, visibility, etc)	Other oceanographic (Tide Height, River discharge, salinity, etc.)	Operational	Gridded Product	Satellite Product	Available from central distributor, Yes/Partially	Recommended	Conditionally recommended	Not Recommended
B-41	NOAA/NESDIS	NCDC Observed Oceanographic	D			✓		✓									☒
B-43	NOAA/NESDIS	NDBC Buoys Meteorological	D	✓			✓				Y				☒		
B-45	NOAA/NESDIS	NDBC Buoys Oceanographic	D		✓	✓		✓		✓	Y				☒		
B-47	NOAA/NESDIS	Sea Surface Temperature	D			✓						Y	Y				☒
B-49	NOAA/NESDIS	Advanced High Resolution (AVHRR) Pathfinder Sea Surface Temperature	D			✓						Y	Y				☒
B-51	NOAA/NOS	Operational Coastal Models	M		✓	✓				✓	Y	Y			☒		
B-53	NOAA/NOS	PORTS Oceanographic Data	D		✓					✓	Y				☒		
B-55	NOAA/NOS	CoastWatch Great Lakes Node Meteorological Observations	D	✓										Y			☒
B-57	NOAA/NOS	CoastWatch Great Lakes Node Oceanographic Observations	D			✓				✓				Y			☒
B-59	NOAA/NOS	NERRS SWMP Meteorological Observations	D	✓			✓				Y			Y		☒	
B-61	NOAA/NOS	NERRS SWMP Oceanographic Observations	D			✓					Y			Y		☒	
B-63	NOAA/NOS	Chesapeake Bay Model	M		✓	✓				✓	Y	Y			☒		
B-65	NOAA/NWS	National Digital Forecast Database	M	✓			✓		✓		Y	Y			☒		
B-67	NOAA/NWS	RTOFS	M		✓	✓				✓	Y	Y				☒	
B-69	NOAA/NWS	NAM Guidance Products	M	✓		✓			✓		Y	Y	Y		☒		
B-71	NANOOS	NANOOS	D		✓	✓											
B-73	Oceanweather, Inc.	Global Wind/Wave Analysis and Forecast	M					✓			Y	Y	Y			☒	
B-75	Oregon Health & Science University	CORIE Models	M		✓	✓				✓		Y					☒

Table 8. Product evaluation result summary (cont).

Appendix B page number (Product Summary Sheet)	Organization	Product Name	Product Type	Wind Speed	Currents	Sea Surface Temperature	Air Temperature	Wave Properties	Operational meteorological properties (Cloud cover, ceiling, visibility, etc)	Other oceanographic (Tide Height, River discharge, salinity, etc.)	Operational	Gridded Product	Satellite Product	Available from central distributor, Yes/Partially	Recommended	Conditionally recommended	Not Recommended
B-77	Oregon Health & Science University	CORIE Observations	D		✓	✓				✓							☒
B-79	OSU, Oceanic & Atmospheric Sciences	Surface Current Maps	D		✓						Y	Y		Y		☒	
B-81	Rutgers, Institute of Marine and Coastal Sciences	COOL	D		✓	✓		✓				Y		Y	☒		
B-83	SECOORA	NCCOOS	D		✓	✓		✓		✓							
B-85	SURA	Interoperability Demonstration Web site	D			✓		✓		✓							
B-87	SURA	Wave Watch 3	M					✓				Y					☒
B-89	Stevens Institute	NYHOPS	M		✓	✓		✓		✓		Y			☒		
B-91	Stevens Institute	NYHOS	D		✓			✓		✓	Y			Y	☒		
B-93	surflne.com	Models and Buoy Observations	M			✓		✓			Y	Y			☒		
B-95	TAMU, Oceanography Department	GCOOS In Situ Observations	D	✓			✓							Y			☒
B-97	TAMU, Oceanography Department	TABS Models	M		✓						Y	Y			☒		
B-99	TAMU, Conrad Blucher Institute	TCOON	D		✓	✓				✓	Y			P	☒		
B-101	Texas General Land Office	TGLO TABS	D		✓	✓					Y			P	☒		
B-103	AFWA	WRF Model	M	✓			✓				Y	Y					☒
B-105	USGS	NWIS Surface-Water Data	D			✓				✓	Y					☒	
B-107	FNMOC	CAAPS	M	✓			✓				Y	Y			☒		
B-109	FNMOC	NOGAPS	M	✓			✓				Y	Y			☒		
B-111	FNMOC	Wave Watch 3 - Global	M					✓			Y	Y			☒		
B-113	FNMOC	Wave Watch 3 - Regional	M					✓			Y	Y			☒		

Table 8. Product evaluation result summary (cont).

Appendix B page number (Product Summary Sheet)	Organization	Product Name	Product Type	Wind Speed	Currents	Sea Surface Temperature	Air Temperature	Wave Properties	Operational meteorological properties (Cloud cover, ceiling, visibility, etc)	Other oceanographic (Tide Height, River discharge, salinity, etc.)	Operational	Gridded Product	Satellite Product	Available from central distributor, Yes/Partially	Recommended	Conditionally recommended	Not Recommended
B-115	FNMOC	NCODA - Meteorological	M	✓			✓				Y	Y				☒	
B-117	FNMOC	NCODA - Oceanographic	M		✓	✓		✓			Y	Y				☒	
B-119	NAVOCEANO	NCOM	M		✓	✓					Y	Y			☒		
B-121	Naval Postgraduate School	CIMT Real-time Wind Product - Data	D	✓								Y		P			☒
B-123	Naval Postgraduate School	CIMT Real-time Wind Product - Model	M	✓								Y					☒
B-125	Naval Postgraduate School	CeNCOOS, COCMP	D		✓						Y	Y		Y			
B-127	NRL	IASNFS	M		✓	✓				✓		Y				☒	
B-129	NRL	HYCOM	M		✓	✓				✓		Y				☒	
B-131	University of Alaska - Fairbanks	Surface Currents	D		✓							Y		Y			☒
B-133	UCal - Davis, Bodega Marine Laboratory	BOON	D		✓	✓				✓		Y		Y		☒	
B-135	Scripps	Near Real-Time Surface Currents	D		✓							Y		Y			
B-137	Scripps	Near Real-Time Surface Currents - California	D		✓							Y		Y		☒	
B-139	Scripps	CDIP Wave Buoys	D			✓		✓			Y			Y	☐	☒	
B-141	Scripps	CDIP Wave Models	M					✓			Y	Y			☒		
B-143	USCB, Marine Science Institute	USCB Surface Currents	D		✓							Y		Y		☒	
B-145	UConn, Marine Sciences Department	LISICOS	D		✓	✓		✓				Y		Y			☒
B-147	Udelaware, College of Marine and Earth Studies	Delaware Bay Mouth HF Radar Network	D		✓							Y		Y			☒
B-149	Udelaware, College of Marine and Earth Studies	DBOS	D		✓	✓											☒

Table 8. Product evaluation result summary (cont).

Appendix B page number (Product Summary Sheet)	Organization	Product Name	Product Type	Wind Speed	Currents	Sea Surface Temperature	Air Temperature	Wave Properties	Operational meteorological properties (Cloud cover, ceiling, visibility, etc)	Other oceanographic (Tide Height, River discharge, salinity, etc.)	Operational	Gridded Product	Satellite Product	Available from central distributor, Yes/Partially	Recommended	Conditionally recommended	Not Recommended
B-151	UGeorgia, SkIO	SABSOON	D		✓	✓				✓		P		Y		☒	
B-153	UMaine, School of Marine Sciences	Gulf of Maine Ocean Currents Model	M		✓	✓				✓		Y			☒		
B-155	UMaine, School of Marine Sciences	GoMOOS Buoys Meteorological	D	✓			✓				Y				☒		
B-157	UMaine, School of Marine Sciences	GoMOOS Buoys Oceanographic	D		✓	✓		✓						P	☒		
B-159	UMaine, School of Marine Sciences	GoMOOS CODAR	D		✓						Y	Y		Y		☒	
B-161	UMaryland, Center for Environmental Studies	Observing System Meteorological	D	✓			✓										
B-163	UMaryland, Center for Environmental Studies	Observing System Oceanographic	D		✓	✓		✓									
B-165	UMiami, RSMAS	Eastern Florida Shelf High Frequency Radar	D		✓						Y	Y		Y		☒	
B-167	UMiami, RSMAS	EFSIS	M		✓	✓				✓	Y	Y			☒		
B-169	UMiami, RSMAS	EPWS/NFS	M		✓	✓				✓	Y	Y			☒		
B-171	UNC - Chapel Hill	ADCIRC	M		✓							Y			☒		
B-173	UNC, Coastal Studies Institute	CODAR	D		✓							Y		Y		☒	
B-175	UNCW, Center for Marine Science	CORMP Observing System	D		✓	✓				✓				P		☒	
B-177	University of North Florida	HiRes WRF Model	M	✓			✓					Y					☒
B-179	University of South Carolina	High Frequency (HF) Radar project	D		✓			✓				Y		Y			☒
B-181	USC, Baruch Institute	SEACOOS Meteorological	D	✓			✓							Y			

Table 8. Product evaluation result summary (cont).

Appendix B page number (Product Summary Sheet)	Organization	Product Name	Product Type	Wind Speed	Currents	Sea Surface Temperature	Air Temperature	Wave Properties	Operational meteorological properties (Cloud cover, ceiling, visibility, etc)	Other oceanographic (Tide Height, River discharge, salinity, etc.)	Operational	Gridded Product	Satellite Product	Available from central distributor, Yes/Partially	Recommended	Conditionally recommended	Not Recommended
B-183	USC, Baruch Institute	SEACOOS Oceanographic	D		✓	✓		✓		✓				Y			
B-185	USC, Baruch Institute	Caro-COOPS Meteorological	D	✓			✓							Y			
B-187	USC, Baruch Institute	Caro-COOPS Oceanographic	D		✓	✓		✓		✓				Y			
B-189	USC, Baruch Institute	Carolinas Coast Meteorological	D	✓			✓							Y			
B-191	USC, Baruch Institute	Carolinas Coast Oceanographic	D		✓	✓		✓		✓				Y			
B-193	USF, College of Marine Science	COMPS	D		✓	✓		✓		✓				Y		<input checked="" type="checkbox"/>	
B-195	USF, College of Marine Science	Observing System	D		✓	✓				✓		Y					<input checked="" type="checkbox"/>
B-197	USF, College of Marine Science	WFS Circulation Model	M		✓	✓						Y			<input checked="" type="checkbox"/>		
B-199	USF, College of Marine Science	IMaRS Observing System	D		✓	✓						Y					<input checked="" type="checkbox"/>
B-201	Weather Flow Inc.	Mesoscale Atmospheric Model	M	✓			✓				Y	Y			<input checked="" type="checkbox"/>		
B-203	Weather Flow Inc.	National Mesonet	D	✓			✓				Y				<input checked="" type="checkbox"/>		
B-205	WHOI	MVCO - Meteorological	D	✓			✓										<input checked="" type="checkbox"/>
B-207	WHOI	MVCO - Oceanographic	D		✓	✓		✓		✓							<input checked="" type="checkbox"/>

As expected, environmental information products from U.S. government sources (such as the Navy's FNMOC and NAVOCEANO, and NOAA sources) compared very well to the evaluation criteria. The highest numerical score was for a wave model product from Scripps Institution of Oceanography. Observing-system products originating from Scripps, Stevens Institute of Technology, and Texas A&M also compared well. Model products from NOAA and the U.S. Navy (FNMOC) also received very high scores, as did commercial products from Geologics Corporation and WeatherFlow.

The product comparisons against our criteria were poorest on average in the Data Quality category. Higher-rated systems were those that received a greater amount of post-run review, or where data assimilation was performed on model products to improve the nowcast or forecast accuracies. In general, the absence of uncertainty or error estimates and procedures for assigning real-time quality flags accounted for low scores.

Many systems did not compare well against the Operational Status criteria. The gaps were generally due to the lack of technical support and absence of redundancy in the systems. Measurement systems generally did not compare well because many of the products were produced by newly emerging technologies in a research environment, and were focused on demonstrating or examining the viability of the technology (HF surface current mapping-radars or models, for example). Systems that require remote stations are inherently more difficult to operate. A significant percentage of HF surface current mapping-radar products fell into this group.

Most of the regional associations (RAs) did not compare well to the Data Quality criteria, because other activities, such as NOAA or universities, performed data quality and operation functions of the monitoring systems. The RAs would then respond that they did not perform these functions, when the data quality functions might, in fact, be performed. In a few cases, the responders did not complete the questionnaire, because they decided that they did not fit into the group we were targeting. The RAs were left on the list to acknowledge their role in facilitating data collection.

The comparison was most favorable in the Access category. Systems that received less than the maximum score in this area typically did not offer products on a 24/365 basis, or did not maintain archived data online for desired periods.

Comparisons for many of the point-measurement observing systems in the Domain, Applicability, and Resolution category were affected by the sparse spatial distributions of the observations. Some respondents expressed frustration that their systems were being evaluated poorly for spatial resolution, and appear to have given up on the questionnaire at this point; hence, their responses were left incomplete. The general scarcity of current data, particularly in coastal areas, makes the information provided by existing current measurement stations valuable.

The Domain, Applicability and Resolution category was useful for resolving differences among model products. Products that evaluated favorably in this area were those with smaller grid elements and an enhanced resolution of the surface layer (top 1 m of the water column), and which reported at a shorter time step.

The extent of spatial representation and the presence of gaps in data-product coverage were not comprehensively examined; these issues are being addressed separately. The preliminary results of that effort suggest that coverage for surface currents is generally poor in coastal areas, where

most SAR operations are performed. The availability of environmental information is also quite variable by location. Areas where marine transportation is important are more comprehensively represented by model or observational products.

3.4 Efficacy of Approach

The concept of using responses by product providers as the basis for product rankings and recommendations was partially successful. Inconsistencies crept into the scoring by way of respondents answering questions incorrectly or having trouble deciding on an appropriate answer. For example, several respondents had trouble deciding between the following answers to question 1, which related to operational status:

- Product has been supporting a variety of clients with operational (must-have now) needs.
- Data are regularly available but the provider is not required or funded to support ‘must have’ operational users.

Some respondents considered themselves fully operational in being able to provide data on a regular basis, whereas other respondents more correctly considered themselves not fully operational in not being able to guarantee data delivery 100 percent of the time due to a lack of redundancy in their system.

Responses to the technical support question also led to inconsistencies. When asked about the level of support made available to clients, some respondents claimed 100-percent support (24 hrs/day, 365 days/year), although it was clear that ‘100-percent support’ consisted of a cell phone number for an on-call staffer, who might not necessarily have immediate computer access to address technical problems.

Where possible, the R&DC reviewed the responses to minimize the influence of differences in interpretation on the part of respondents. Product scores were changed if reviewers found an obvious conflict between a survey response and information presented either elsewhere on the same survey or on the respondent’s Web site. In some cases, the R&DC was unable to resolve answers that appeared to be incorrect, either due to time constraints or because the provider did not respond to further questions.

4. RECOMMENDATIONS

On the basis of the product scores generated by this project, the project team recommends adding the surface-wind and surface current products listed in Table 9 and Table 10 to the SAROPS EDS.

Table 9. Wind-information sources recommended for SAROPS.

Appendix Reference	Organization	Product Name	Product Type: Model or Data
B-43	NOAA/NESDIS	NDBC Buoys Meteorological	D
B-65	NOAA/NWS	National Digital Forecast Database	M
B-69	NOAA/NWS	NAM Guidance Products	M
B-107	FNMOCC	CAAPS	M
B-109	FNMOCC	NOGAPS	M
B-155	UMaine, School of Marine Sciences	GoMOOS Buoys Meteorological	D
B-201	Weather Flow Inc.	Mesoscale Atmospheric Model	M
B-203	Weather Flow Inc.	National Mesonet	D

Table 10. Surface current information sources recommended for SAROPS.

Appendix Reference	Organization	Product Name	Product Type: Model or Data
B-45	NOAA/NESDIS	NDBC Buoys Oceanographic	D
B-51	NOAA/NOS	Operational Coastal Models	M
B-53	NOAA/NOS	PORTS Oceanographic Data	D
B-63	NOAA/NOS	Chesapeake Bay Model	M
B-81	Rutgers, Institute of Marine and Coastal Sciences	COOL	D
B-89	Stevens Institute	NYHOPS	M
B-91	Stevens Institute	NYHOS	D
B-97	TAMU, Oceanography Department	TABS Models	M
B-99	TAMU, Conrad Blucher Institute	TCOON	D
B-101	Texas General Land Office	TGLO TABS	D
B-119	NAVOCEANO	NCOM	M
B-153	UMaine, School of Marine Sciences	Gulf of Maine Ocean Currents Model	M
B-157	UMaine, School of Marine Sciences	GoMOOS Buoys Oceanographic	D
B-167	UMiami, RSMAS	EFSIS	M
B-169	UMiami, RSMAS	EPWS/NFS	M
B-171	UNC - Chapel Hill	ADCIRC ¹	M
B-197	USF College of Marine Services	WFS Circulation Model	M

¹ This product includes wind-forcing absent from the ADCIRC version presently in SAROPS.

The model products listed in Table 9 are directly usable in SAROPS. The NAM Model covers most of the continental U.S., with an acceptable 12-km resolution of coastal areas, and a time resolution of 1 hour during the first 18 hours and 3 hours thereafter. The spatial resolution of the NDFD is significantly better at 5 km, but its temporal resolution is presently 3 hours. In the future, however, NOAA is planning to upgrade the spatial resolution of the NDFD to 2.5 km, and its temporal resolution to 1 hour, for predictions out to 24 hours. The FNMOC Global wind product, which provides data at a $1^\circ \times 1^\circ$ spatial resolution and a 12-hour time step, should be replaced by the FNMOC CAAPS/COAMPS and NOGAPS models. The WeatherFlow mesoscale model is recommended as the best solution for areas not adequately covered by other evaluated products.

The WeatherFlow Mesonet product provides the most extensive network of observational wind data available along the coasts. WeatherFlow supplements the NOAA/NWS observing network with its own coastal stations. The NOAA NDBC network provides the best observations for offshore areas. Regional observing networks such as GoMOOS are recommended to supplement, where possible, model products for coastal areas.

The surface current sources in Table 10 consist of six systems providing point measurements, one HF radar system, and ten models. The point-measurement systems, principally from NOAA, have a limited direct value for generating search-target trajectories, but do provide independent information on the local surface current field that might also cover areas not well represented by models. The Rutgers COOL system collects CODAR radials and presents surface current vectors in real time for the East Coast between Cape Cod and Cape Hatteras. The Rutgers product has performed well in reproducing USCG SLDMB trajectories. Although additional work is needed to refine the processing and filtering of returns to reduce measurement error, as of the time of this report, this system appears to be the most robust of the HF radar systems in operation.

Open-ocean areas are still best represented by the NAVOCEANO NCOM model that is presently in the EDS. Closer inshore, the ADCIRC East and West models presently in the EDS are recommended for current predictions on the east and west coasts of the U.S. mainland. The University of North Carolina (UNC) version of ADCIRC, which covers only the U.S. East Coast, is also recommended. The ADCIRC East and West products account only for the tidal portion of the total current. The UNC ADCIRC product incorporates wind-forcing, and would therefore be expected to provide a more accurate representation of surface currents. The project team recommends that the two existing ADCIRC products be retained in the EDS, and that the UNC-Chapel ADCIRC product be added.

Operational coastal models provide current analyses and predictions in the next area closer to the coast. The Gulf of Maine, the Gulf Coast, and the Florida Shelf are covered by the GoMOOS, TABS, WFS, and EFSIS models. The Chesapeake Bay 3-D and other NOAA operational models, and the Prince William Sound model, cover a few of the embayments along the U.S. coast.

The next group consists of products conditionally recommended for SAROPS, including the FNMOC NCODA product, listed in Table 11, which provides analyses of winds and other atmospheric variables, using a multivariate Optimum Interpolation (OI) technique, for a number of military operational needs. NCODA provides only an analysis of present conditions.

Table 11. Wind-information sources conditionally recommended for SAROPS.

Appendix Reference	Organization	Product Name	Product Type: Model or Data
B-11	JPL	Ocean Wind	M
B-59	NOAA/NOS	NERRS SWMP Meteorological Observations	D
B-115	FNMOCC	NCODA - Meteorological	M
B-129	NRL	HYCOM	M

The JPL Ocean Winds product provides analyses and forecasts derived from QuikSCAT winds blended with outputs from the COAMPS meteorological model. This product is operational for the northeast Pacific area on a 27-km grid.

The NRL HYCOM is conditionally recommended based on its scheduled transition to operational status in early FY08. While it is presently running in near real-time, it has not been validated. Once operational it should be evaluated for inclusion in the SAROPS EDS.

Another conditionally recommended product is the NERRS data set for 27 NOAA Reserves along the east and west coasts. Many of the stations provide data to NOAA NDBC; data for the estuarine areas sampled by the remaining stations are available from the Centralized Data Management Office (CDMO) in South Carolina.

The list of conditionally recommended current products (Table 12) is dominated by HF radar systems associated with the IOOS RAs. The HF radar technology appears promising, and the academic community is actively seeking to link systems along the east and west coasts.

Table 12. Surface current sources conditionally recommended for SAROPS.

Appendix Reference	Organization	Product Name	Product Type: Model or Data
B-5	ASA	Regional Tidal Constituent Models	M
B-23	Horizon Marine, Inc.	Eddy Watch – Observing System	D
B-29	LSU, Coastal Studies Institute	WAVCIS	D
B-31	Mercator-Ocean	Mercator Ocean Forecasts	M
B-67	NOAA/NWS	RTOFS	M
B-117	FNMOCC	NCODA - Oceanographic	M
B-125	Naval Postgraduate School	CeNCOOS, COCMP	D
B-127	NRL	IASNFS	M

Table 12. Surface current sources conditionally recommended for SAROPS (cont).

Appendix Reference	Organization	Product Name	Product Type: Model or Data
B-133	UCal - Davis, Bodega Marine Laboratory	BOON	D
B-137	Scripps	Near Real-Time Surface Currents - California	D
B-143	UCSB, Marine Science Institute	UCSB Surface Currents	D
B-151	UGeorgia, SkIO	SABSOON	D
B-159	UMaine, School of Marine Sciences	GoMOOS CODAR	D
B-165	UMiami, RSMAS	Eastern Florida Shelf High Frequency Radar	D
B-173	UNC, Coastal Studies Institute	CODAR	D
B-175	UNCW, Center for Marine Science	CORMP Observing System	D
B-193	USF, College of Marine Science	COMPS	D

In addition to the Rutgers COOL system in the recommended group above, the GoMOOS Gulf of Maine product and COCMP product appear to be best suited for SAROPS use. The spatial coverage of the west-coast systems is incomplete, however. The coverage of the southeastern and Alaska region HF radar system is very scattered and should be improved if the technology is proven to be viable.

Components of the ASA Regional Tidal Model product might be considered to fill in coastal and embayment areas where tides are a significant component of the total current vector. The ASA product does not factor in the wind-driven circulation. A subset of the ASA data incorporates the effects of fresh-water inflows.

The Mercator Ocean Model product was evaluated in an effort to identify an independent data set for the U.S. East Coast. However, the provider of this product indicated that it is updated on a weekly basis. This relatively low update rate is not considered competitive with other prediction products.

The remaining products in Table 12 include the RTOFS and IASNFS products, which provide predictions, and the NCODA and Horizon Marine products, which do not provide forecast data.

Several observing systems in Table 12 were not recommended either because their level of stability and quality control was relatively low or because the effort required to incorporate their data did not appear to be cost effective.

4.1 Other Product Recommendations

Recommendations on issues related to environmental data inputs include the following:

- Observation systems not part of a larger network cannot be efficiently used by the USCG. Combining coastal observing data at an agency such as NOAA (NDBC) appears to provide a cost-effective way to make the data from these systems accessible.
- The NOAA Operational Model Archive and Distribution System (NOMADS) acquires observational data and modeling products from a range of sources and then disseminates this information to customers. The NOMADS program might provide another path for SAROPS developers to acquire data from a centralized location. SAROPS developers should consider using NOMADS as the primary or backup provider of model and observational products for the EDS.
- The Florida Current Data File and Mariano Seasonal Ship drift products are atlas-type data sets that are currently stored on the EDS server. These products are simple, but they are considered adequate, by the SAROPS developers, for providing current information when better sources are not available. These products should be retained in the EDS. A similar product offering a comparable capability is recommended for surface winds.
- Table 10 does not mention deployment of Self-Locating Datum Marker Buoys (SLDMBs). SLDMBs are recognized as effective in quantifying surface currents. Deployment of multiple SLDMBs is recommended for large search areas in which other information sources, such as models, indicate that the current field is not uniform.
- SAROPS presently uses only wind and current information for search object trajectory calculations and for search pattern planning. Features planned for future inclusion in SAROPS include target probability of detection algorithms to aid in search-pattern planning. This feature will require visibility, ceiling altitude, and wave height data.

A second capability discussed for SAROPS includes algorithms to estimate survival times and survival probabilities for persons in the water (PIWs) or in survival craft (life rafts, for example). This capability will require sea surface temperature, air temperature, relative humidity, and wind speed data. **Note:** This report does not identify or rank products for parameters other than surface winds and currents.

4.2 Recommendations for Future Work

Because the availability of environmental information products is extremely dynamic, the Office of Search and Rescue should determine the level of effort needed to ensure that the list of information products is kept current; that new sources are identified; and that liaison with the information providers is conducted. If the Office of Search and Rescue does not have the internal capability to perform these tasks, we recommend that they work with an organization such as Ocean.US to maintain an inventory of products.

The R&DC is nearing completion of a separate task as part of this project to create overlay maps of the spatial coverage of the systems described in this report. When the overlay work is completed, we recommend that Office of Search and Rescue (CG-534) examine and note gaps in the coverage of surface current fields in coastal areas, embayments and estuaries. CG-534 should make Coast Guard needs known through Ocean.US and IOOS activities to further develop

observing-network or coastal model-initiatives sponsored by other government agencies or research activities.

The HF radar technology seems to provide a very promising means of providing surface current data for the past and the present, and for a few hours into the future. The Coast Guard should take an active role in working with the system operators to refine data-processing procedures and to validate the skill of this technology, including use of SLDMBs in intercomparison studies.

As stated earlier, Table 10 does not mention deployment of SLDMBs, recognized as effective in quantifying surface currents. We strongly recommend that CG-534 take steps to include SLDMB-derived, real-time surface current values in SAROPS. We recommend that SAROPS include an objective analysis interpolation tool that could derive localized surface-current fields from multiple, operating SLDMBs.

We recommend that CG-534 develop a fallback product for surface winds similar to the Mariano and Florida Current Files. This product would provide monthly or seasonally varying wind-speed and direction-probability distributions, based on historic observations (for example, climatic atlases or Coast Pilot summaries), on a coarse ($1^{\circ} \times 1^{\circ}$) grid. This product would be available for open-ocean areas (away from the coast), when data or forecasts are not otherwise be available.

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APPENDIX A. ENVIRONMENTAL INFORMATION PRODUCTS IDENTIFIED

Table A-1. U.S. Government agency data-provider candidates.

Data Provider	Detailed Name	Product Name	Point of Contact
NASA	National Aeronautics and Space Administration, Marshall Space Flight Center, Earth Science Office	Sea Ice	Michael Goodman 256-961-7890 michael.goodman@nasa.gov
		Sea Surface Temperature	
NOAA, NDBC	National Oceanic and Atmospheric Administration, National Data Buoy Center	NDBC Meteorological Buoys	Dave Gilhousen 228-688-2840 dave.gilhousen@noaa.gov
		NDBC Oceanographic Buoys	
NOAA, NERRS	National Estuarine Research Reserve System	System Wide Monitoring Program (SWMP) Oceanographic Observed	Beth Ebersole 301-713-3155 x173 beth.ebersole@noaa.gov
		System Wide Monitoring Program (SWMP) Meteorological Observed	
NOAA, NESDIS	National Environmental Satellite, Data, and Information Service; National Climatic Data Center	NCDC Meteorological Modeled (NCEP)	Benjamin Watkins 828-271-4800 benjamin.watkins@noaa.gov
		NCDC Meteorological Observed	
		NCDC Ocean Observed	
		Sea Surface Temperature	Richard Reynolds 828-271-4302 richard.w.reynolds@noaa.gov
	National Oceanographic Data Center	Advanced High Resolution (AVHRR) Pathfinder Sea Surface Temperature	Kenneth Casey 301-713-3272 kenneth.casey@noaa.gov

Table A-1. U.S. Government agency data-provider candidates (cont).

Data Provider	Detailed Name	Product Name	Point of Contact
NOAA, NOS	National Ocean Service, Center for Operational Oceanographic Products and Services (CO-OPS)	CO-OPS Observational Data	Mark Vincent 301-713-2890 x151 mark.vincent@noaa.gov
		Chesapeake Bay Operational Forecast System (CBOFS)	
		Galveston Bay Operational Forecast System (GBOFS)	
		Great Lakes Operational Forecast System (GLOFS)	
		Port of New York and New Jersey Operational Forecast System (NYOFS)	
		St. John's River Operational Forecast System (SJROFS)	
		Physical Oceanographic Real-Time System (PORTS) Surface Current Data	Peter Stone 301-713-2890 x149 peter.stone@noaa.gov
	CoastWatch/Great Lakes Research Laboratory(GLRL)	The Great Lakes Coastal Forecasting System (GLCFS) - Meteorological Observed	George Leshkevich 734-741-2265 george.leshkevich@noaa.gov
		The Great Lakes Coastal Forecasting System (GLCFS) - Oceanographic Observed	
	Office of Coast Survey	Chesapeake Bay Model	Tom Gross 301-713-2809 tom.gross@noaa.gov
NOAA, NWS	National Weather Service	National Digital Forecast Database (NDFD)	Robert Thompson Phone # unavailable robert.thompson@noaa.gov
	National Centers for Environmental Prediction (NCEP)	North American Mesoscale (NAM) Model Guidance Products	Geoff DiMego 301-763-8000 x7221 geoff.dimego@noaa.gov
	Environmental Modeling Center (EMC)	Real Time Ocean Forecast System (RTOFS)	Carlos Lozano Phone # unavailable carlos.lozano@noaa.gov
U.S. Air Force	Air Force Weather Agency (AFWA)	Weather Research and Forecasting (WRF) Model	Evan Kuchera Phone # unavailable evan.kuchera@afwa.af.mil

Table A-1. U.S. Government agency data-provider candidates (cont).

Data Provider	Detailed Name	Product Name	Point of Contact
U.S. Geological Survey, Water Resources	N/A	National Water Information System (NWIS) Surface-Water Data	Stephen Blanchard 703-648-5629 sfblanch@usgs.gov
U.S. Navy, FNMOC	Fleet Numerical Meteorology and Oceanography Center	Centralized Atmospheric Analysis and Prediction System (CAAPS)	Command Duty Officer 831-656-4325 cdo@fnmoc.navy.mil
		Navy Coupled Ocean Data Assimilation (NCODA) - Meteorological	Ranjit Passi 831-656-4572 Ranjit.passi@navy.mil, Andrew.Hergert@navy.mil
		Navy Coupled Ocean Data Assimilation (NCODA) - Oceanographic	
		Navy Operational Global Atmospheric Prediction System (NOGAPS)	Command Duty Officer 831-656-4325 cdo@fnmoc.navy.mil
		Wave Watch 3 - Global	
		Wave Watch 3 - Regional	
U.S. Navy, NAVOCEANO	Naval Oceanographic Office	Global Navy Coastal Ocean Model (NCOM)	Frank Bub 228-688-4759 frank.bub@navo.navy.mil
U.S. Navy, NPS	Naval Postgraduate School, Department of Oceanography	Central and Northern California Ocean Observing System (CeNCOOS), Coastal Ocean Currents Monitoring Program (COCMP)	Jeff Paduan 831-656-3350 paduan@nps.edu
	Center for Integrated Marine Technologies (CIMT)	Center for Integrated Marine Technologies (CIMT) Real-time Wind Product - Model	Leslie Rosenfeld 831 656 3253 lkrosenf@nps.edu
		Center for Integrated Marine Technologies (CIMT) Real-time Wind Product - Data	

Table A-1. U.S. Government agency data-provider candidates (cont).

Data Provider	Detailed Name	Product Name	Point of Contact
U.S. Navy, NRL	Naval Research Lab, Monterey, CA	Coupled Ocean/Atmosphere Mesoscale Prediction System (COAMPS)	Dr. Eric O. Hartwig 818-656-4721 coamps@nrlmry.navy.mil
		Hybrid Coordinate Ocean Model (HYCOM)	E Joseph Metzger Phone # unavailable joe.metzger@nrlssc.navy.mil
	Ocean Dynamics and Prediction Branch	Intra-Americas Sea Ocean Nowcast/Forecast System (IASNFS)	Dong S. Ko 228-688-5448 ko@nrlssc.navy.mil

Table A-2. University/research center/ocean observing system data-provider candidates.

Data Provider	Detailed Name	Product Name	Point of Contact
AOOS	Alaska Ocean Observing System	Observing System	Carl Schoch 907-644-6712 cschoch@nprb.org
California Institute of Technology, Jet Propulsion Laboratory	Earth Science Section M/S 300-323	Ocean Wind	Yi Chao 818-354-8168 yi.chao@jpl.nasa.gov
		Ocean Surface Current	
	Physical Oceanography Distributed Active Archive Center (PO.DAAC)	QuikSCAT Reduced Merged GDR	Richard Chen 818-354-1259 richard.chen@jpl.nasa.gov
College of William and Mary	Virginia Institute of Marine Science (VIMS)	Observing System	Todd Nelson 804-684-7283 nelson@vims.edu
ESR	Earth & Space Research	Ocean Surface Current Analyses – Real Time (OSCAR)	John Gunn 206-726-0501 gunn@esr.org
Florida Institute of Technology	Department of Marine & Environmental Systems	Observing System	Lee Harris 321-674-7273 lharris@fit.edu
Florida State University	Center for Ocean-Atmospheric Prediction Studies (COAPS)	FSU QuikSCAT Objective Gridded Winds	Dr. Mark Bourassa 850-644-6923 bourassa@coaps.fsu.edu
Johns Hopkins University	Applied Physics Laboratory	Ocean Marine Wind	Frank M. Monaldo 240-228-8651 frank.monaldo@jhuapl.edu
		Sea Surface Temperature	
Louisiana State University	Coastal Studies Institute	Wave-Current-Surge Information System (WAVCIS)	Bill Gibson 225-578-2947 bgibson@lsu.edu
NANOOS	Northwest Association of Networked Ocean Observing Systems	Northwest Association of Networked Ocean Observing Systems (NANOOS)	Jan Newton 206-543 9152 newton@apl.washington.edu
Oregon Health & Science University	Oregon Graduate Institute, Center for Coastal and Land-Margin Research	Columbia River Estuary Real-Time Observation and Forecasting System (CORIE) Models	Phil Barrett 503-748-4059 barrett@ebs.ogi.edu
		Columbia River Estuary Real-Time Observation and Forecasting System (CORIE) Observations	

Table A-2. University/research center/ocean observing system data-provider candidates (cont).

Data Provider	Detailed Name	Product Name	Point of Contact
Oregon State University	College of Oceanic & Atmospheric Sciences	Surface Current Maps	Mike Kosro, PI 541-737-3079 kosro@coas.oregonstate.edu
Rutgers University	Institute of Marine and Coastal Sciences	Coastal Ocean Observation Lab (COOL)	Hugh Roarty 732-932-6555 hroarty@imcs.rutgers.edu
SECOORA	Southeast Coastal Ocean Observing Regional Association	North Carolina Coastal Ocean Observing System (NCCOOS)	Jesse Cleary 919-962-4323 jcleary@email.unc.edu
SURA	Southeast Universities Research Association (SURA) Coastal Ocean Observing and Prediction (SCOOP) Program	Interoperability Demonstration Web site	Joanne Bintz 202-408-7872 bintz@sura.org
		Wave Watch 3	
Stevens Institute of Technology	Center for Maritime Systems/ Davidson Laboratory	New York Harbor Observation and Prediction System (NYHOPS)	Brian Fullerton 201-216-5290 bfullert@stevens.edu
		New York Harbor Observing System (NYHOS)	
Texas A&M University	Oceanography Department	Gulf of Mexico Coastal Ocean Observing System (GCOOS) In Situ Observations	Worth Nowlin 979-845-3900 wnowlin@tamu.edu
		Texas Automated Buoy System (TABS) Modeling Effort	Dr. Robert Hetland 979-458-0096 rhetland@ocean.tamu.edu
Texas A&M University, Corpus Christi	Conrad Blucher Institute	Texas Coastal Ocean Observation System	Gary Jeffress 361-825-2720 jeffress@falcon.tamucc.edu
Texas General Land Office	Oil Spill Prevention & Response	Texas Automated Buoy System	Buzz Martin 512-475-4611 buzz.martin@glo.state.tx.us
University of Alaska, Fairbanks	School of Fisheries and Ocean Sciences	Surface Currents	Rachel Potter 907-474-5709 rpotter@ims.uaf.edu
University of California, Davis	Bodega Marine Laboratory	Bodega Ocean Observing Node (BOON)	John Largier 707-875-2211 jllargier@ucdavis.edu

Table A-2. University/research center/ocean observing system data-provider candidates (cont).

Data Provider	Detailed Name	Product Name	Point of Contact
University of California, San Diego	Scripps Institution of Oceanography, Marine Physical Laboratory	Near Real-Time Surface Currents	Mark Otero 858-822-3537 motero@mpl.ucsd.edu
		Near Real-Time Surface Currents - California	
	Ocean Engineering Research Group	Wave Buoy	Julie Thomas 858-534-3034 jot@splash.ucsd.edu
		Wave Models	
University of California, Santa Barbara	Marine Science Institute	Observing System	Brian Emery 805-893-8480 emery@icess.ucsb.edu
University of Connecticut	Marine Sciences Department	Long Island Sound Integrated Coastal Observing System (LISICOS)	Adam Houk 860-405-9167 adam.houk@uconn.edu
University of Delaware	College of Marine and Earth Studies	Delaware Bay Observing System (DBOS)	Mohsen Badiey 302-831-3687 badiey@udel.edu
		Delaware Bay Mouth HF Radar Network	Bruce Lee Lipphardt 302-831-6836 brucel@udel.edu
University of Georgia	Skidaway Institute of Oceanography	South Atlantic Bight Synoptic Offshore Observational Network (SABSOON) Observing System	Trent Moore 912-598-3308 moore@skio.peachnet.edu
University of Maine	School of Marine Sciences	Gulf of Maine Ocean Observing System (GoMOOS) Buoys Oceanographic	Linda Mangum 207-581-4320 ljm@umeoce.maine.edu
		Gulf of Maine Ocean Observing System (GoMOOS) Buoys Meteorological	
		Gulf of Maine Ocean Observing System (GoMOOS) CODAR	
		Gulf of Maine Ocean Currents Model	Stephen Cousins 207-581-4302 cousins@umit.maine.edu

Table A-2. University/research center/ocean observing system data-provider candidates (cont).

Data Provider	Detailed Name	Product Name	Point of Contact
University of Maryland	Center for Environmental Studies	Observing System Oceanographic	Carole Derry 410-221-8451 cderry@hpl.umces.edu
		Observing System Meteorological	
University of Miami, RSMAS	Rosenstiel School of Marine and Atmospheric Sciences, Ocean Prediction Experimental Laboratory / Applied Marine Physics (OPEL/AMP)	East Florida Shelf Information System (EFSIS)	Dr. Christopher Mooers 305-421-4088 cmooers@rsmas.miami.edu
		Extended Prince William Sound Nowcast/Forecast System (EPWS/NFS)	
	Meteorology and Physical Oceanography (MPO)	Observing System	Lynn K. Shay 305-421-4075 nshay@rsmas.miami.edu
University of North Carolina	Coastal Studies Institute	CODAR	Michael Muglia 909-962-0301 muglia@email.unc.edu
University of North Carolina, Chapel Hill	Department of Marine Sciences, Coastal Circulation and Transport (CCAT) Laboratory	Advanced Circulation Model (ADCIRC)	Brian Blanton 919-962-0022 brian_blanton@unc.edu
University of North Carolina, Wilmington	Center for Marine Science	Coastal Ocean Research & Monitoring Program (CORMP) Observing System	Jennifer Dorton 910-962-2777 dortonj@uncw.edu
University of North Florida	College of Computing Sciences, Engineering and Construction, Advanced Weather Information Systems Laboratory	HiRes WRF Model	Patrick Welsh 904-620-2756 pwelsh@unf.edu

Table A-2. University/research center/ocean observing system data-provider candidates (cont).

Data Provider	Detailed Name	Product Name	Point of Contact
University of South Carolina	Baruch Institute	Southeast U.S. Atlantic Coastal Ocean Observing System (SEACOOS) Oceanographic	Jeremy Cothran 803-777-4469 jcothran@asg.sc.edu
		Southeast U.S. Atlantic Coastal Ocean Observing System (SEACOOS) Meteorological	
		Carolinas Coastal Ocean Observing and Prediction System (Caro-COOPS) Oceanographic	
		Carolinas Coastal Ocean Observing and Prediction System (Caro-COOPS) Meteorological	
		Carolinas Coast Oceanographic	
		Carolinas Coast Meteorological	
		Observing System	
			Richard Styles 803-777-4588 rstyles@geol.sc.edu
University of South Florida	College of Marine Science	West Florida Shelf (WFS) Circulation Model	Dr. Robert H. Weisberg 727-553-1568 weisberg@marine.usf.edu
		Observing System	
	College of Marine Science, Institute for Marine Sensing	IMaRS Observing System	Frank Muller-Karger 727-553-3335 carib@marine.usf.edu
	Ocean Modeling and Prediction Laboratory	Coastal Ocean Monitoring and Prediction System (COMPS)	Clifford Merz 727-553-3729 cmerz@marine.usf.edu
Woods Hole Oceanographic Institution	Martha's Vineyard Coastal Observatory	Martha's Vineyard Coastal Observatory - Meteorological	Janet Fredericks 508-289-2573 jfredericks@whoi.edu
		Martha's Vineyard Coastal Observatory - Oceanographic	

Table A-3. Commercial data-provider candidates.

Data Provider	Detailed Name	Product Name	Point of Contact
Applied Science Associates, Inc.	ASA	Regional Tidal Constituent Models	Mark Wholey 401-789-6224 mwholey@appsci.com
GeoLogics Corporation	N/A	Global Ocean Data Assimilation Experiment (GODAE) High Resolution Sea Surface Temperature - Pilot Project (GHRST-PP)	Susan Heinz 808-982-9175 sheinz@geologics.com
Horizon Marine, Inc.	N/A	Eddy Watch - Observing System	Steven Anderson 508-748-1860 steve@horizonmarine.com
Oceanweather, Inc.	N/A	Global Wind/Wave Analysis and Forecast	Brian Callahan 203-661-3091 brianc@oceanweather.com
surflines.com	N/A	Models and Buoy Observations	Dan Martin 714-374-0556 dan_martin@buoyweather.com
Weather Flow, Inc.	Weather Networks	National Mesonet	Jay Titlow 757-868-5362 jtitlow@weatherflow.com
		Mesoscale Atmospheric Model	Jay Titlow 757-868-5366 jtitlow@weatherflow.com

Table A-4. International agency data-provider candidates.

Data Provider	Detailed Name	Product Name	Point of Contact
Mercator-Ocean	N/A	Mercator Ocean Forecasts	Vincent Toumazou 33 5 61 39 38 02 vincent.toumazou@mercator-ocean.fr

Table A-5. Products removed from the survey list.

Data Provider	Site Address	Product Name	Reason for Removal
AccuWeather	//www.accuweather.com	Weather Forecast Data	Accuweather responded that they do not provide what we're interested in.
AER, Inc.	//www.aer.com	hCast	Other sources can meet USCG forecast needs.
		eCast	
		sCast	
Air Sports Net	//www.usairnet.com/	Weather Forecast Data	POC information unavailable
ARGO, Argo Ocean Profiling Network	//www.argo.ucsd.edu/FrArgo_data_and.html	Argo Data	Product is not compatible with USCG needs.
AWS -Weather Bug	//www.weatherbug.com/	Weather Bug	POC information unavailable
Columbia University, International Research Institute (IRI)	//iri.columbia.edu/cgi-bin/htsearch Also try: //ingrid.ldeo.columbia.edu/	Lamont-Doherty Earth Observatory (LDEO) databases	Product is not compatible with USCG needs.
Cornell University, Northeast Regional Climate Center (NRCC)	//www.nrcc.cornell.edu/	Climate Data	Product is not compatible with USCG needs.
DTN	//www.dtn.com	Aviation Weather	Links to Meteorlogix site
Environment Canada	//www.weatheroffice.ec.gc.ca	Marine Weather Buoy Data	Products are available through NOAA
GLOS, Great Lakes Observing System	//glos.us/conditions.php	Links to regional observation providers	Site acts as RA for Great Lakes area but did not respond.
Intellicast	//www.intellicast.com	Weather Forecast Data	POC information unavailable
Jamaica Weather Information	//www.myforecast.com Also try: //www.go-jamaica.com/weather/currentcondmain.php	Marine Forecasts Tides 2005	Redistributor of data
Jenifer Clark's Gulfstream	//users.erols.com/gulfstrm/	Gulf stream charts	Sailing charts and links to other sites
Johns Hopkins University, Applied Physics Laboratory	//www.nodc.noaa.gov/dsdt/cw/index.html	Advanced Very High Resolution Radiometer (AVHRR)	Product is not compatible with USCG needs.
Johns Hopkins University, Applied Physics Laboratory	//www.oso.noaa.gov/goes/	Geostationary Operational Environmental Satellites (GOES)	Product is not compatible with USCG needs.

Table A-5. Products removed from the survey list (cont).

Data Provider	Site Address	Product Name	Reason for Removal
LocusWeather	//www.midcoast.com/~locuswx/	General Marine Weather Forecast	Product does not provide unique information and is not compatible with USCG needs.
Louisiana State University, Coastal Studies Institute	//www.esl.lsu.edu/home/	Southern Regional Climate Center weather and climate data	Product is not compatible with USCG needs.
Massachusetts Institute of Technology, Lincoln Lab	//www.ll.mit.edu/AviationWeather/sitdisplay.html	Integrated Terminal Weather System (ITWS)	Not an information generator.
Meteorlogix	//www.meteorlogix.com/welcome.cfm	MxVision MxInsight	POC information unavailable
Midwestern Regional Climate Center (MRCC)	//mcc.sws.uiuc.edu/	Midwestern Climate Information System (MICIS)	Product is not compatible with USCG needs.
NASA, Goddard Space Flight Center	//rapidfire.sci.gsfc.nasa.gov/ Also try: //modis.gsfc.nasa.gov/	Moderate Resolution Imaging Spectroradiometer (MODIS) / Aqua & Terra Missions	Product is not compatible with USCG needs.
NASA, Goddard Space Flight Center	//goes.gsfc.nasa.gov/	GOES - Geostationary Operational Environmental Satellites (+NOAA)	Product is not compatible with USCG needs.
NASA, Marshall Space Flight Center	//weather.msfc.nasa.gov/spot/sport_observations.html	Short-Term Prediction Research and Transition (SPoRT) Center	Product is not compatible with USCG needs.
NASA, Marshall Space Flight Center	//www.ghcc.msfc.nasa.gov/	Global Hydrology and Climate Center (GHCC)	Product is not compatible with USCG needs.
NASA, National Space Science and Technology Center (NSSTC), Marshall Space Flight Center, UAH	//weather.msfc.nasa.gov/GOES/goeseastconusir.html	Global Hydrology and Climate Center (GHCC) satellite image and weather forecast data	Product is not compatible with USCG needs.
Navy	www.nwc.navy.mil/weather	Weather Observation	Links to NWS
NOAA	//www.coralreefwatch.noaa.gov	Coral Reef Watch	No data past 2002
NOAA	//floats.pmel.noaa.gov/floats	Float data	No data
NOAA	//www.crh.noaa.gov/dyx/wxnow/lake_index.php	Weather	Links to NWS

Table A-5. Products removed from the survey list (cont).

Data Provider	Site Address	Product Name	Reason for Removal
NOAA, National Environmental Satellite, Data, and Information Service (NESDIS)	//www.ssd.noaa.gov/	Satellite Services Division (SSD)	Product is not compatible with USCG needs.
NOAA, National Environmental Satellite, Data, and Information Service (NESDIS)	//www.ngdc.noaa.gov/	National Geophysical Data Center	Product is not compatible with USCG needs.
NOAA, National Environmental Satellite, Data, and Information Service (NESDIS)	//www.goes.noaa.gov/	GOES	Product is not compatible with USCG needs.
NOAA, National Environmental Satellite, Data, and Information Service (NESDIS)	//manati.orbit.nesdis.noaa.gov/quikscat/	QuikSCAT	Product is not compatible with USCG needs.
NOAA, NESDIS, Coastwatch	//www.nesdis.noaa.gov/satellites.html	Satellite Data	Product is not compatible with USCG needs.
NOAA, NESDIS, National Climatic Data Center	//nomads.ncdc.noaa.gov/data.php	NOAA Operational Model Archive and Distribution System (NOMADS)	Redistributor of data
NOAA, NESDIS, National Coastal Data Development Center	//www.ncddc.noaa.gov/docs/business_plan.html	Searchable metadata catalog of coastal data	Product is not compatible with USCG needs.
NOAA, NMFS, Pacific Fisheries Environmental Lab	//www.nmfs.noaa.gov/	Ocean/climate fields for fisheries research	Product is not compatible with USCG needs.
NOAA, NMFS, Pacific Fisheries Environmental Lab	//www.nmfs.noaa.gov/	OceanWatch	Product is not compatible with USCG needs.
NOAA, NMFS, Pacific Marine Environmental Laboratory	//ferret.wrc.noaa.gov/NVODS/servlets/index	National Virtual Ocean Data System (NVODS)	Product is not compatible with USCG needs.
NOAA, NOS, Coastal Services Center	//www.csc.noaa.gov/	Links to providers of data for 10 regional areas and nationwide	Product is not compatible with USCG needs.
NOAA, NOS, Office of Coast Survey	//nauticalcharts.noaa.gov/csd/op/nowcoast.htm	NOWCOAST	Redistributor of data
NOAA, NWS	//www.isos.noaa.gov/	NOAA's Environmental Real-Time Observation Network (NERON)	Redistributor of data
NOAA, NWS, National Weather Service	//www.spc.noaa.gov/climo/	Storm Prediction Center (SPC)	Product is not compatible with USCG needs.

Table A-5. Products removed from the survey list (cont).

Data Provider	Site Address	Product Name	Reason for Removal
NOAA, Office of Oceanic and Atmospheric Research, Cooperative Institute for Research in Environmental Sciences (CIRES)	//www.cdc.noaa.gov/	Climate Diagnostics Center (CDC)	Product is not compatible with USCG needs.
NOAA, Office of Oceanic and Atmospheric Research, Geophysical Fluid Dynamics Lab (GFDL)	//nomads.ncdc.noaa.gov/	NOAA Operational Model Archive and Distribution System (NOMADS)	Product is not compatible with USCG needs.(See similar NOMADS site above)
NowCasting International	//www.nowcasting.ie/	Nowcasting Pro Nowcasting Wilkens Service in partnership with Wilkens Weather	POC information unavailable
Ocean.US, Surface Current Mapping Initiative	//www.ocean.us/news	Links to regional data providers	Data redistributors. Refer to report.
Princeton University	//www.aos.princeton.edu/WWWPUBLIC/PROFS/	Nowcast/Forecast of Gulf of Mexico Loop Current and Eddies	Experimental product.
Princeton University	//www.aos.princeton.edu/WWWPUBLIC/htdocs.pom/index.html	Weather Radar	Video stream
SERCC, Southeast Regional Climate Center	//www.sercc.com/climateinfo/climate_info.html	Precipitation Maps	Product is not compatible with USCG needs.
Super Typhoon	www.supertyphoon.com	Weather	Links to other sites such as NWS, FNMOC, and satellite data
U.S. Army Corps of Engineers, U. S. Army Engineer Waterways Experiment Station	//chl.erdc.usace.army.mil/	Wave Data Sites	Product is not compatible with USCG needs.
U.S. Naval Forces Marianas	//www.guam.navy.mil/weather/metoc/INDEX.htm	Weather	Link to NWS
U.S. Navy, Naval Maritime Forecast Center (NMFC)	https://metocph.nmci.navy.mil/	Navy Joint Typhoon Warning Center	Product is not compatible with USCG needs.
U.S. Navy, Naval Oceanographic Office (NAVOCEANO)	https://www.navo.navy.mil/	Operational Oceanographic Products	Other NAVOCEANO sites were examined

Table A-5. Products removed from the survey list (cont).

Data Provider	Site Address	Product Name	Reason for Removal
U.S. Navy, Naval Research Lab (NRL), Monterey, CA	//www.nrlmry.navy.mil/researchproj.htm	Automated Tropical Cyclone Forecast System (ATCF)	Product is not compatible with USCG needs.
U.S. Navy, Naval Research Lab (NRL), Monterey, CA	//ocean.jpl.nasa.gov/cgi-bin/dataset_search_new.cgi?category=3&name=COAMPS	Coupled Ocean/Atmosphere Mesoscale Prediction System (COAMPS)	Product does not appear to be operational
University Corporation / National Center for Atmospheric Research, Research Applications Laboratory	//www.rap.ucar.edu/weather/	Research Applications Program (RAP) Real-Time Weather Data	Products appear research oriented
University Corporation / National Center for Atmospheric Research, University Corporation / National Center for Atmospheric Research	//www.rap.ucar.edu/weather/model/	MM5	Products appear research oriented
University of California, San Diego (UCSD)	//www.argo.ucsd.edu/	Argo	Product is not compatible with USCG needs.
University of California, San Diego, Joint Environmental Data Analysis Center (JEDAC)		Ocean Temperature	Product is not compatible with USCG needs.
University of Colorado , Cooperative Institute for Research in Environmental Sciences (CIRES)	//cires.colorado.edu/	Atmospheric data	Product is not compatible with USCG needs.
University of Colorado, Colorado Center for Astrodynamics Research	//argo.colorado.edu/~realtime/welcome/	CCAR Real-Time Altimetry	Product is not compatible with USCG needs.
University of Hawaii	//www.hawaii.edu/HIMB/FADS/	Fish Aggregating Devices (FADS)	No oceanographic data - buoy locations There appears to be a link to local weather, but the link is not operational.
University of Hawaii, Department of Meteorology	//lumahai.soest.hawaii.edu/	Weather Server	No response received

Table A-5. Products removed from the survey list (cont).

Data Provider	Site Address	Product Name	Reason for Removal
University of Massachusetts, School of Marine Science & Technology	//www.smast.umassd.edu/Fishes/	Finite Volume Coastal Ocean Model (FVCOM)	Site does not appear operational and did not respond.
University of Rhode Island	//Coastwatch.chesapeakebay.noaa.gov	Coast Watch	Site is inactive
University of South Florida	//pritchard.marine.usf.edu/TBmodel/nowcast.html	Tampa Bay nowcast (real-time) model	Still undergoing development.
Weather Channel	//www.weather.com/	Weather	POC information unavailable
Weather Hub	//www.wxusa.com/	Weather Forecast	POC information unavailable
Weather Underground	//www.wunderground.com/	Weather Underground	Product is not compatible with USCG needs.
WeatherMatrix	//www.weathermatrix.net/	Weather, Hurricane, Snow Forecast	Product is not compatible with USCG needs.
Weathertap	//aviationweather.gov/	Aviation Weather	
Western Regional Climate Center (WRCC)		Weather Data Plots	Product is not compatible with USCG needs.
Wilkens Weather	//www.wilkensweather.com/	Nowcasting Wilkens Service in partnership with NowCasting International	POC information unavailable
World Meteorological Organization	//worldweather.wmo.int/	World Weather Information Service	Product is not compatible with USCG needs.

APPENDIX B. PRODUCT SUMMARY SHEETS

This appendix provides a summary sheet for each environmental information product for which a survey response was received. Included on each sheet is:

- Information about the data product and provider.
- A listing of the applicable environmental parameters.
- A representation of the geographical coverage area of the data.
- A statement of applicability of the product to SAROPS.

Some evaluations and recommendations have been changed from the interim version of this report. The scoring results were considered to be of a sensitive nature and have been retained for internal Coast Guard distribution only.

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Product Provider: Alaska Ocean Observing System (AOOS)

Center / Department / Section: Modeling

Product Name: Observing System

Parameters:	Salinity	Sea-surface currents
	Sea surface/subsurface temperature	River discharge
	Water level	Wave direction
	Wave max height	Wave peak period
	Wave significant height	

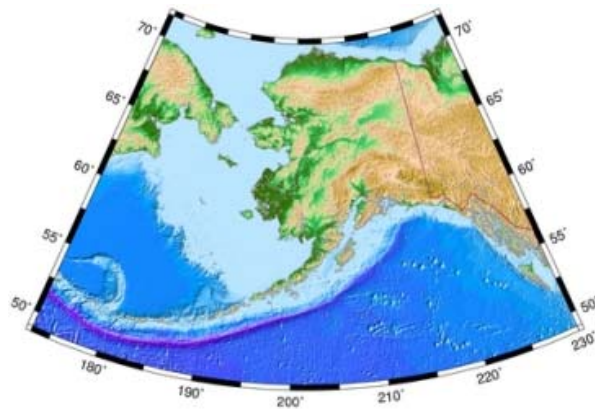
Product Type: Oceanographic Observed

Funding Source: Non-profit

Point of Contact Information:

Coverage: Alaska

Name: Carl Schoch
Phone: 907-299-1332
Email: cschoch@aoos.org
Web site: <http://ak.aos.org/>



Description: The Alaska Ocean Observing System (AOOS) is the umbrella regional association for multiple Alaska regional observing networks (Gulf of Alaska, Bering Sea/Aleutian Islands, Prince William Sound, Cook Inlet, Southeast and Arctic) that are being developed as part of the national Integrated Ocean Observation System (IOOS).

AOOS, when fully developed, will manage and distribute a wide variety of observation and model data for Alaska, divided into 3 regions:

- Gulf of Alaska, Southeast
- Aleutian Islands, Bering Sea
- Arctic Ocean, Beaufort Sea, Chukchi Sea

The product described here is focused on the Prince William Sound demonstration where AOOS integrates and provides observational data and model forecasts.

The observational data are collected at a central database at the University of Alaska in Fairbanks for archiving and dissemination by way of a Web page. The Web page provides user communities such as mariners, pilots, and resource managers with specific information products they requested through a series of scoping workshops. Some of the observational data products are provided by federal agencies such as the NDBC weather buoys, the Natural Resources Conservation Service (NRCS) precipitation stations, and the NWS weather radar. AOOS has additionally provided funds to upgrade the weather buoys with Acoustic Doppler Current

Profilers and power supplies, funded the deployment of additional weather stations in areas with data gaps or specific user needs, and funded the deployment of a series of weather cameras that are of particular interest to pilots and the NWS.

The Snotel weather observation network, with stations in Prince William Sound and elsewhere in Alaska, are operated by the NRCS and not available through NDBC. These stations provide winds, pressure, precipitation, snow accumulation, solar, temperature. Some stations also measure humidity.

The real time data streams, with the exception of the camera data, are of importance to the modeling efforts. The archive of historical and non-real-time data is also important to the research community as time series and for model hindcasts.

AOOS is also responsible for coordinating the running of a meteorological model (RAMS) and an ocean model (ROMS). The ROMS ocean model is run at JPL and is considered pre-operational. The RAMS model is run by the University of Alaska and is considered operational.

AOOS is also planning to implement a wave model, Simulating Waves in the Nearshore (SWAN), which is under development at Texas A&M. This is believed to apparently approaching operational status. AOOS has deployed 5 moorings, one at Hinchinbrook and one at Montague and roving moorings that they deploy on an as-needed basis. Although there is currently no telemetry for these instruments, implementation of telemetry is part of a 5-year plan.

Their funding is stable with funding from the Oil Spill Recovery Institute (OSRI) for maintenance in Prince William Sound, and federal funding for other AOOS activities.

SAROPS Applicability: The regional ocean observing systems (OOS) provide a valuable role as a facilitator and integrator of disparate data providers and sources. They bring together scientists from different institutions with specific experience and expertise of the region and its environment. This product's weakest area was related to quality-control measures applied to the data. Improvements could be made by including uncertainty/error estimates with the data and assigning a QA lead. Its data products can be obtained from more centralized systems (e.g., NDBC), so this site is not recommended for inclusion in the SAROPS EDS.

Product Provider: Applied Science Associates, Inc.

Center / Department / Section:

Product Name: Regional Tidal Constituent Models

Parameters: Sea-surface currents

River discharge

Product Type: Oceanographic Modeled

Funding Source: Private

Point of Contact Information:

Coverage: Global

Name: Mark Wholey

Phone: 401-789-6224

Email: mwholey@appsci.com

Web site: <http://www.coastmap.com>



Description: The Harmonic Tidal Model Database includes regional tidal models for various locales across the globe. Tidal current predictions are derived from model predictions in a manner similar to that used by NOAA to create current predictions from observations. This approach is equivalent to that used to generate ADCIRC model currents.

Areas that may be useful for potential USCG use include: Gulf of Alaska and Cook Inlet; Cape Cod area; Columbia River, James River and Chesapeake Bay; Narragansett Bay; New York Harbor, Lower Hudson River, and Long Island Sound; Puget Sound; Prince William Sound; and San Francisco Bay.

SAROPS Applicability: The current predictions produced by this product reflect only the tidal component of the total current field at any point in time. ASA has indicated that river discharge is a parameter; this means that river flow has been incorporated into the calculations for some areas. The actual current field may be significantly different as a result of wind action, storm surge, and freshwater flows from tributary rivers. It is not clear whether the model fields represent surface currents because they may be vertically averaged. On the other hand, this product provides surface current information for embayments at a level of detail otherwise unavailable. This information would be considered the best available for those areas. This product is conditionally recommended for inclusion in the SAROPS EDS.

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Product Provider: California Institute of Technology, Jet Propulsion Laboratory (JPL)
Center / Department / Section: Physical Oceanography Distributed Active Archive Center (PO.DAAC)
Product Name: QuikSCAT Reduced Merged GDR

Parameters: Surface wind speed/gusts

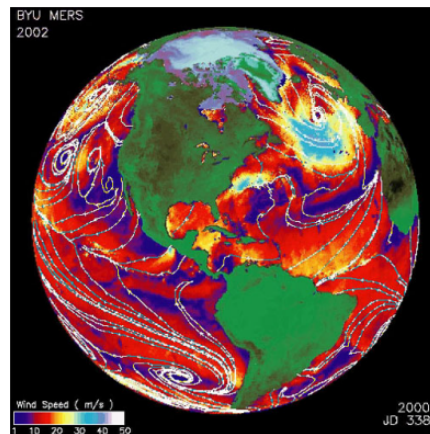
Product Type: Atmospheric Observed

Funding Source: Public

Point of Contact Information:

Coverage: Global

Name: Richard Chen
Phone: 818-354-1259
Email: richard.chen@jpl.nasa.gov
Web site: <http://www.jpl.nasa.gov>



Description: This product provides near-surface (10-m reference height) wind speed and direction, with 90% global coverage daily from the QuikSCAT satellite. The GDR (Geophysical Data Record) refers to the fact data are measured at a 25-km resolution. The resulting wind vector cells are then gridded into a 1440x720 global grid. The data are produced from satellite-derived wind data (SeaWinds, flying on QuikSCAT) that is processed to provide global wind vectors. The GDR process analyzes swaths of data; 1-3 passes per day at higher latitudes and 0-1 passes at lower latitudes.

The data are near-real time, with a 3–4 hour delay on a 25-km grid. A 12.5-km grid is planned for later in 2006. All wind data are adjusted to a 10-m altitude. One of the fields provides quality flags, but not uncertainties. Another field is equivalent to the maximum likelihood estimator, which provides estimates on the likelihood of correctness of the (up to) 4 possible wind solutions.

The SeaWinds on QuikSCAT Level 3 data set consists of daily gridded values of scalar wind speed, meridional (U) and zonal (V) components of the wind velocity, and wind speed squared derived from the NASA Quick Scatterometer. Rain probability is determined by using the Multidimensional Histogram (MUDH) Rain Flagging technique and time given in fraction of a day are also available in each Level 3 file. Separate maps are provided for both the ascending pass (6AM LST equator crossing) and descending pass (6PM LST equator crossing). Data are currently available in Hierarchical Data Format (HDF) and exist from 19 July 1999 to present.

The Level 3 data were created from the Direction Interval Retrieval with Threshold Nudging (DIRTH) wind vector solutions contained in the QuikSCAT Level 2B data. The Level 3 data are provided on an approximately 0.25 degree resolution (1440 pixels longitude by 720 pixel

latitude), global grid. By maintaining the data at nearly the original sampling resolution and separating the ascending and descending passes, very little overlap occurs in one day. In the few instances where overlap occurs within the same wind vector cell row of a swath, the data are averaged. Overlap between subsequent swaths, however, is over-written.

Reference Sites:

<http://nereids.jpl.nasa.gov/cgi-bin/wind.cgi?show=overview>

http://podaac.jpl.nasa.gov/quikscat/qscat_doc.html

SAROPS Applicability: This satellite-derived wind product provides near real-time wind data at 10m for 90% of the globe and would be useful for SAR operations. The data are better suited for open ocean use. The product's time lag and daily time step lowers its value for SAR. This product is not recommended for inclusion in the SAROPS EDS.

Product Provider: California Institute of Technology, Jet Propulsion Laboratory (JPL)

Center / Department / Section: Earth Science Section

Product Name: Ocean Surface Current

Parameters:	Salinity	Sea-surface currents
	Sea surface/subsurface temperature	Water level

Product Type: Oceanographic Modeled

Funding Source: Public

Point of Contact Information:

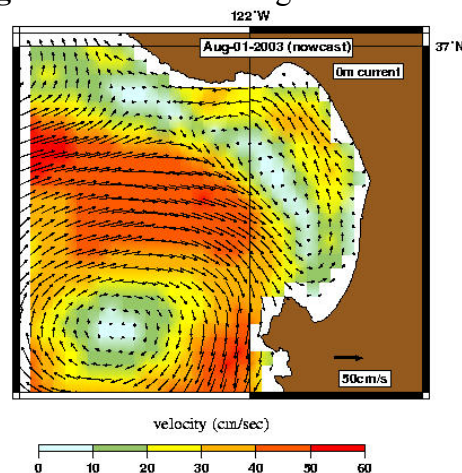
Coverage: N.E. Pacific through Southern CA

Name: Yi Chao

Phone: 818-354-8168

Email: Yi.Chao@jpl.nasa.gov

Web site: <http://ourocean.jpl.nasa.gov/models.html>



Description: The JPL, Earth Science Section is currently working on current data forecasts using the Regional Ocean Modeling System (ROMS) hydrodynamic model. A basin-scale ROMS has been developed over the Pacific Ocean with a spatial resolution of 12.5 km, and is used for boundary conditions to feed nested regional circulation models. The following schedule is planned for regional model implementation.

Operational Schedule:

Central and Northern California	Available in August 2006, produced daily. 48 hour forecast, one-hour time step.
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Prince William Sound	2007 Summer
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Southern California	2007 / 2008
---------------------	-------------

Northeast Pacific Ocean	2007 / 2008
-------------------------	-------------

Data are currently available as images, animations and Live Access Server (LAS) access. Data can all be made available in NetCDF as that is the original format.

ROMS is a primitive-equation model using a coastline- and terrain- following curvilinear coordinates. A detailed model description can be found at:

http://www.atmos.ucla.edu/cesr/ROMS_page.html.

SAROPS Applicability: This system is presently not operational. The product would benefit from improvements in prediction checks and from infrastructure improvements. This product is not recommended for inclusion in the SAROPS EDS at this time.

Product Provider: California Institute of Technology, Jet Propulsion Laboratory (JPL)

Center / Department / Section: Earth Science Section

Product Name: Ocean Wind

Parameters:	Air temperature	Air temperature daily max/min
	Area forecast	Atmospheric pressure
	Precipitation type/rate	Relative humidity
	Summary	Surface wind speed/gusts
	Wind stress	

Product Type: Atmospheric Modeled

Funding Source: Public

Point of Contact Information:

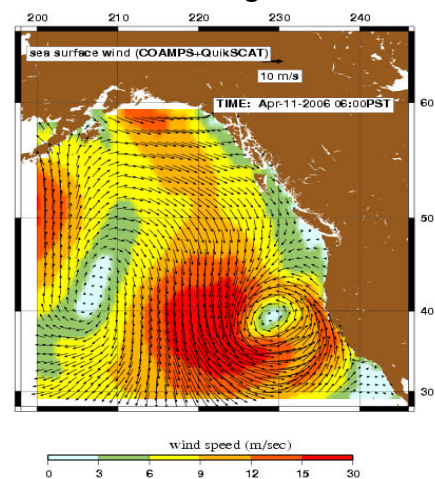
Coverage: N.E. Pacific through Southern CA

Name: Yi Chao

Phone: 818-354-8168

Email: Yi.Chao@jpl.nasa.gov

Web site: <http://ocean.jpl.nasa.gov/cgi-bin/index.cgi>



Description: The JPL Earth Science Section delivers a product that combines satellite data with mesoscale model/predicted winds. This method is used to improve the wind results derived purely from QuikSCAT. Pure QuikSCAT observed winds have gaps in spatial and temporal coverage, and exhibit “coastal contamination” (i.e., 2 footprints, 2 x 25 km, hence large errors are seen in the coastal region). To remedy this, satellite derived QuikSCAT winds are blended with outputs from the COAMPS meteorological model.

The operational products are for the North East Pacific Ocean, where COAMPS (27-km resolution) and QuikSCAT winds are combined. This product is updated once a day. Data are currently available as images, animations and Live Active Server (LAS) access.

JPL also provides pure (not blended) forecast winds in other Pacific Ocean regions: Southern California Coastal Ocean (using MM5), Central and Northern California (using COAMPS 3km) and Prince William Sound, Alaska (RAMS 4 km).

Reference site:

http://jaws2.jpl.nasa.gov/publication/GRL_QuikSCAT_COAMPS.pdf

SAROPS Applicability: This product combines remotely-sensed data with model data to provide high resolution wind data which are very valuable for SAR operations. The product has a specific focus on resolving near-shore wind conditions, which is especially valuable. They have experience with providing the results in a format that would allow for relatively straightforward integration with SAROPS. The operational value of this product would improve with enhancements to system redundancy. The product's horizontal resolution and data time step are very well suited for SAR. This site is recommended for inclusion in the SAROPS EDS.

Product Provider: College of William and Mary, Virginia Institute of Marine Science (VIMS)

Center / Department / Section: Physical Sciences

Product Name: Observing System

Parameters:	Sea-surface currents	Salinity	Sea surface/subsurface temp
	Turbidity	Water level	Wave direction
	Wave max height	Wave peak period	Wave significant height

Product Type: Oceanographic Observed

Funding Source: Public

Point of Contact Information:

Coverage: York River, VA

Name: Todd Nelson

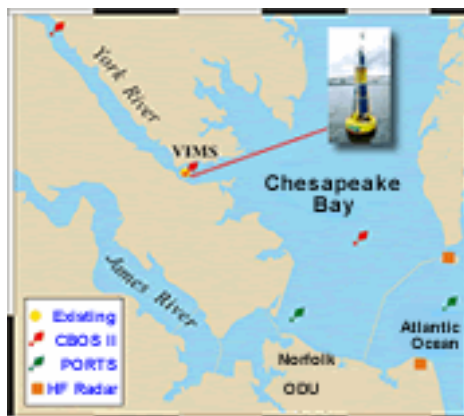
Phone: 804-684-7283

Email: nelson@vims.edu

Web sites:

http://www.vims.edu/~lbrass/vims_obs.html

<http://www.vims.edu/realtime/>



Description: The following site provides SAR 6-hour average winds at Gloucester Point, York River, VA: http://www.testdods.vims.edu/data/VIMS_6_Hr_Winds_Last10Days.html.

Data are presented as received; no quality control is performed. The data sampling intervals at the VIMS buoy vary from 5 minutes for water velocity data to 15 minutes for surface water quality data to 1 hour (20 minute wave burst) for wave data.

SAROPS Applicability: While useful for SAR training uses, this station provides information that is applicable to only a small area. It would be useful if it were available as part of a larger group of wind and current stations. This product is not recommended for the inclusion in the SAROPS EDS.

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Product Provider: Earth & Space Research

Center / Department / Section:

Product Name: Ocean Surface Current Analyses – Real Time (OSCAR)

Parameters: Sea-surface currents

Product Type: Oceanographic Modeled

Funding Source: Non-profit

Point of Contact Information:

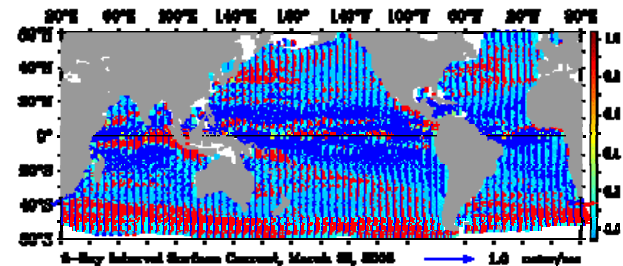
Coverage: Tropical Pacific

Name: John Gunn

Phone: 206-726-0501

Email: gunn@esr.org

Web site: <http://www.oscar.noaa.gov>



Description: Earth and Space Research (ESR) is a small, non-profit scientific institute whose purpose is to perform and otherwise advance scientific research, for public dissemination and benefit, on topics relating to climate and environment.

The goal of the OSCAR project at ESR is to transform the NASA-sponsored research surface current model into a processing system and data center that will provide operational ocean surface velocity fields derived from satellite altimeter and vector wind data to a broad-based user community. ESR analyzes satellite data and use a model to calculate surface currents from satellite data. They use algorithms that are able to handle near-equator data, which is traditionally difficult. Typically the analysis is made daily and the time lag to availability is 1 or 2 weeks when images and data are available from the Web site. They also provide tools to compare results with drifter data (Argos).

The initial regional focus is the tropical Pacific, where ESR provides data for a variety of users, with potential applications in fisheries management and recruitment, monitoring debris drift, larvae drift, oil spills, fronts and eddies, as well as on-going large scale ENSO monitoring, diagnostics and prediction. The data will be subjected to extensive validation and error analysis, and applied to various ocean, climate and dynamic basic research problems.

The project will eventually transition to operational oceanographic applications. The eventual end product will be velocity maps updated daily, with a goal for eventual 2-day maximum delay from time of satellite measurement. Grid resolution will be increased to one-quarter degree for the basin scale. A preliminary version of this enhanced global model is available at www.oscar.noaa.gov/datadisplay2/index.html with validation and error analysis available at www.esr.org/~bonjean/oscar/global_validation/. Implementation of significant improvements in this global model is anticipated over the next year.

SAROPS Applicability: This product combines remotely-sensed data to provide current and wind data. The product is designed for a number of applied oceanographic problems, but its suitability for SAR is poor due to its long delay time and coarse resolution. The product is not yet considered fully operational. Its forecast cycle and spatial resolution are not suited for USCG missions. This product is not recommended for inclusion in the SAROPS EDS.

Product Provider: Florida Institute of Technology (FIT)

Center / Department / Section: Department of Marine & Environmental Systems

Product Name: Observing System

Parameters: Sea-surface currents
Water level
Wave peak period

Sea surface/subsurface temperature
Wave direction
Wave significant height

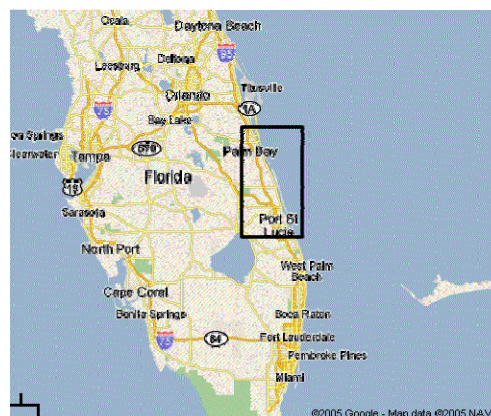
Product Type: Oceanographic Observed

Funding Source: Private

Point of Contact Information:

Name: Lee Harris
Phone: 321-674-7273
Email: lharris@fit.edu
Web site: <http://www.fit.edu/AcadRes/dmes>

Coverage: Florida – East Coast



Description: The FIT Marine & Environmental Systems program currently operates two observing systems that are not yet operational or completely operational. Nearshore wave and current measurements are made at Sebastian Inlet, but are not yet available in real time. Real-time surface wind and weather measurements are operating at Sebastian Inlet, along with a web cam.

A second observing system is located in Stuart, Florida (Martin County) near Jensen Public Beach. This system contains an offshore wave gage system that is not currently operational, but is planned in the near future. Real-time surface wind and weather measurements are made at Jensen Beach, and a web cam is in operation.

SAROPS Applicability: These two observing stations for Florida are not currently operational, which is reflected in the low score given in the operational status area. In addition, the system did not meet any of the data quality measures, limiting its use for USCG operations. This product is not recommended for inclusion in the SAROPS EDS.

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Product Provider: Florida State University (FSU)

Center / Department / Section: Center for Ocean-Atmospheric Prediction Studies (COAPS)

Product Name: FSU QuikSCAT Objective Gridded Winds

Parameters: Surface wind speed/gusts

Wind stress

Product Type: Atmospheric Observed

Funding Source: Public

Point of Contact Information:

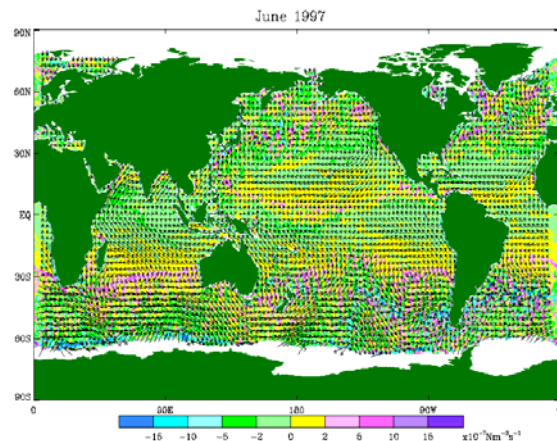
Coverage: Global

Name: Dr. Mark Bourassa

Phone: 850-644-6923

Email: bourassa@coaps.fsu.edu

Web site: <http://www.coaps.fsu.edu/>



Description: This product is essentially satellite-derived wind speed and stress vector components. The COAPS/FSU objectively-analyzed product incorporates QuikSCAT data and produces four daily fields (4 times a day- daily average) of pseudostress using a variational approach (direct minimization) with tuning parameters objectively determined using Generalized Cross Validation (GCV). This method greatly reduces spurious curl and divergence that occur near swath edges. These products are on either 0.5 x 0.5 or 1 x 1 degree grids. Data fields are pseudostress components. This approach utilizes only QuikSCAT observations filtered by the NOF (Normalized Objective Function) rain flag and should be considered as a research quality data set. The reference height for wind speed is 10 m. The stress vector information can be used to derive wind direction and a conversion table is provided.

The FSU Center for Atmospheric Prediction Studies receives data directly from a commercial vendor, with no gaps in the grid as opposed to the version available from NASA. Additionally, the Center for Atmospheric Prediction Studies receives it in a timelier manner and the data are more accurate than the NASA version, especially in relation to wind direction.

Data are available in NetCDF format via OpenDAP and FTP. The primary use of the FSU Quikscat product is to drive ocean models. The current operational user is NOAA – OSCAR. COAPS have administered some measure of testing and are satisfied with the test results.

Reference Sites:

Objectively Analyzed Product:

http://www.coaps.fsu.edu/scatterometry/Qscat/gridded_docs.shtml#PFL

Research Group Site:

<http://www.coaps.fsu.edu/>

SAROPS Applicability: This product combines remotely-sensed data with model data to provide high resolution wind data that are very valuable for SAR operations. The product provides data in a format readily accessible by SAROPS but not in a timely fashion. The inclusion of wind direction in the output files is needed to enhance the value of the product. The minimal technical support and system redundancy lowers the operational status score. The significant data time lag and spatial resolution lowers its value as an information source for SAR planning. This site is not recommended for inclusion in the SAROPS EDS.

Product Provider: GeoLogics Corporation

Center / Department / Section:

Product Name: Global Ocean Data Assimilation Experiment (GODAE) High Resolution Sea Surface Temperature – Pilot Project (GHRSSST-PP)

Parameters: Sea surface/subsurface temperature

Product Type: Oceanographic Observed

Funding Source: Non-profit

Point of Contact Information:

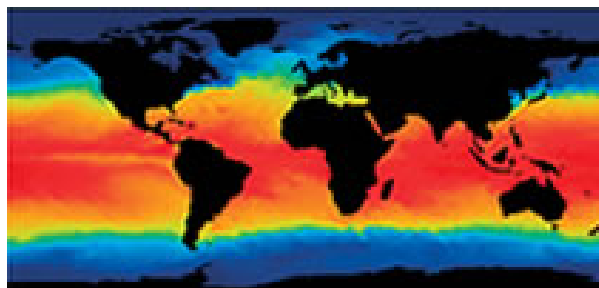
Coverage: Global

Name: Susan Heinz

Phone: 808-982-9175

Email: sheinz@geologics.com

Web site: <http://www.geologics.com>
<http://www.usgodae.org/>



Description: The Global Ocean Data Assimilation Experiment (GODAE) high-resolution sea surface temperature pilot project provides a new generation of global high-resolution (<10km) [SST](#) data products to the operational oceanographic, meteorological, climate and general scientific community, in real time and delayed mode.

Every day, the [GHRSSST-PP processing systems](#) produce SST products from several complementary satellites including from Moderate Resolution Imaging Spectroradiometer (MODIS), Advanced Very High Resolution Radiometer (AVHRR), Advanced Microwave Scanning Radiometer Enhanced (AMSRE), Tropical Rainfall Measuring Mission (TRMM) Microwave Imager (TMI), Advanced Along Track Scanning Radiometer (AATSR), etc and in situ SST data streams to a common NetCDF format. Both integrated observation ([L2P](#)) and analysis ([L4](#)) products are available.

SAROPS Applicability: This product nearly met all evaluation criteria ideals. Minor shortcomings noted were in technical support availability and output time step. For SST, however, the output time step may be adequate for USCG uses. The output format will make the integration of this product relatively straightforward. This product's global coverage and resolution make it recommended for inclusion in the SAROPS EDS.

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Product Provider: Horizon Marine, Inc.

Center / Department / Section:

Product Name: Eddy Watch – Observing System

Parameters: Sea-surface currents

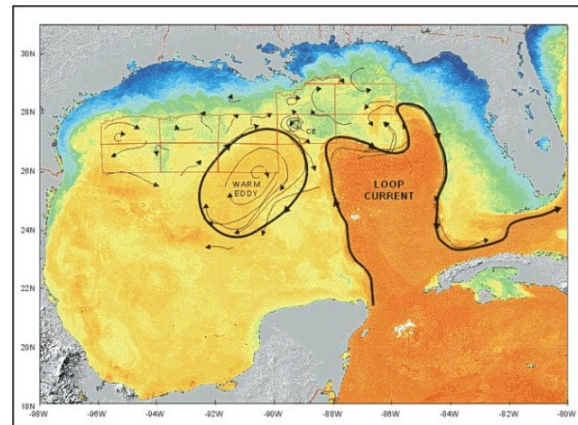
Product Type: Oceanographic Observed

Funding Source: Federal/Private

Point of Contact Information:

Name: Steven Anderson
Phone: 508-748-1860
Email: steve@horizonmarine.com
Web site: <http://www.horizonmarine.com>

Coverage: Gulf of Mexico



Description: Horizon Marine, Inc. is an oceanographic services company that specializes in operational oceanography. They operate the Eddy Watch advisory service in the Gulf of Mexico and in the offshore Trinidad region. The Gulf program produces real-time ocean current maps with emphasis on the position and strength of the Loop Current and eddies that migrate throughout the basin. Eddy Watch tracks the position and strength of the Loop Current, detects the separation of anticyclonic (warm core) eddies from the loop, identifies and monitors these eddies as they migrate across the northern Gulf of Mexico, and predicts the likelihood that an eddy will encounter a particular site within a user-specified time.

The analysis is done by deploying drifting buoys, about 22 per month, into the Gulf of Mexico. The number of buoys deployed is based on Horizon's client (offshore oil and gas industry) needs. The real-time buoy data consists of GPS locations; data are collected at a receiving station at Louisiana State University (LSU) and then sent to Horizon Marine every morning. The data are then analyzed by scientists at Horizon Marine, and analysis of daily drift patterns is provided to Horizon's clients later that morning. In addition to the analysis products, near real-time buoy locations are available on a Web site.

Horizon also has a collaborative agreement with Accurate Environmental Forecasting (AEF) in which the buoy data are used as a component of an operational hurricane forecast model that is run for the Gulf of Mexico.

SAROPS Applicability: These data are valuable for SAR cases that occur in the Gulf of Mexico in the region of eddies. Horizon Marine has a strong infrastructure and a long history of providing operational data and support to commercial clients. The data provide a synoptic view of the current and future conditions and cannot be integrated into SAROPS at present. This product's data time lag and QA support are factors that reduce its value for USCG use. It is not recommended for incorporation into SAROPS but may be useful as a supplemental data product. This is the only real-time, in situ effort in this area.

This product is not recommended for inclusion in the SAROPS EDS, but would be useful as a supplemental data product for the interpretation of circulation in the Gulf of Mexico.

Product Provider: Johns Hopkins University (JHU)

Center / Department / Section: Space / Applied Physics Laboratory (APL)

Product Name: Ocean Marine Wind

Parameters:	Summary	Surface wind speed/gusts
	Wind stress	Wind turbulent kinetic energy

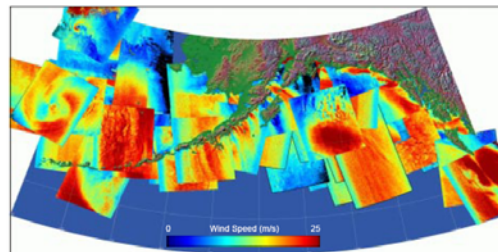
Product Type: Atmospheric Observed

Funding Source: Non-profit

Point of Contact Information:

Coverage: Gulf of Alaska

Name: Frank Monaldo
Phone: 240-228-8648
Email: frank.monaldo@jhuapl.edu
Web site: <http://fermi.jhuapl.edu/>



Description: In the framework of a joint NOAA/NESDIS Alaska SAR (Synthetic Aperture Radar) demonstration, wind speed and direction fields are derived from RADARSAT SAR imagery and model data for the Gulf of Alaska and the Northwest Atlantic. The system uses Canadian satellites launched by NASA. NOAA gets the U.S. allotment of satellite time. They generally need to request specific satellite passes two weeks in advance, although this time framed can be shortened for emergencies such as oil spills.

The process involves obtaining SAR imagery as they become available. These data are sent to NOAA at Camp Springs, MD via FTP where it is processed into wind speed images with a 1-km grid resolution. The data are then made available to the public and the Alaska weather service. Model data (MM5 and NOGAPS 1 degree) are used for wind direction, and the combined wind speed/direction product is made available to NOAA as NetCDF and is used in the Advanced Weather Interactive Processing System (AWIPS) system.

SAROPS Applicability: This product's operational value is affected by the lack of QA redundancy. It may be used for offshore waters. Based on time lag and time step values, this product is not compatible with SAROPS. This product is not recommended for inclusion in the SAROPS EDS.

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Product Provider: Johns Hopkins University (JHU)

Center / Department / Section: Space/Applied Physics Laboratory (APL)

Product Name: Sea Surface Temperature

Parameters: Sea surface/subsurface temperature

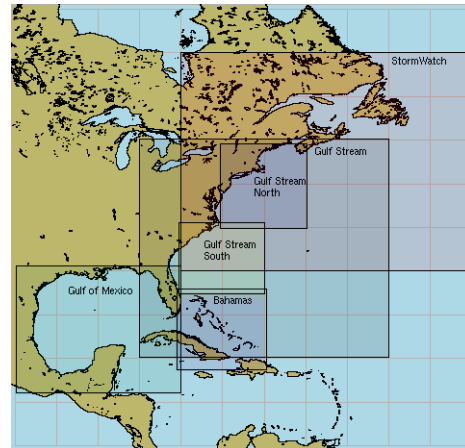
Product Type: Oceanographic Observed

Funding Source: Non-profit

Point of Contact Information:

Name: Frank Monaldo
Phone: 240-228-8648
Email: frank.monaldo@jhuapl.edu
Web site: <http://fermi.jhuapl.edu/>

Coverage: Various Coastal Regions



Description: APL is a research institute that provides SST (satellite) imagery for research and educational purposes. The product focuses on rapid delivery of SST data so that data are available within 15 min–1 hour of satellite overpass, from the Advanced Very High Resolution Radiometer (AVHRR) on the NOAA polar-orbiting satellites.

The data are available as Portable Network Graphic (PNG) image files and temperature data can be extracted from PNG images. They are operational but do not currently support “must have” reliability.

Surface currents and river discharge can be inferred from images, but are not delivered as actual data.

The regions covered are the Gulf Stream Region, Chesapeake Bay, “StormWatch” (80°W to 45°W, 30°N to 55°N), Gulf of Mexico and Bahamas (82°W to 70°W, 19°N to 28°N).

SAROPS Applicability: The questionnaire indicates that the product provides current data, but this appears to be only as a visual interpretation of the SST maps and this is not directly useful for SAROPS. Considering that this product is SST, the data time lag and time step are appropriate for USCG use. The survey responses indicate that, for these parameters, this product would be usable, if needed for offshore areas. This product is not recommended for inclusion in the SAROPS EDS at this time.

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Product Provider: Louisiana State University (LSU)

Center / Department / Section: Coastal Studies Institute

Product Name: Wave-Current-Surge Information System (WAVCIS)

Parameters:	Sea-surface currents	Salinity	Sea surface/subsurface temperature
	Turbidity	Water level	Wave direction
	Wave max height	Wave peak period	Wave significant height

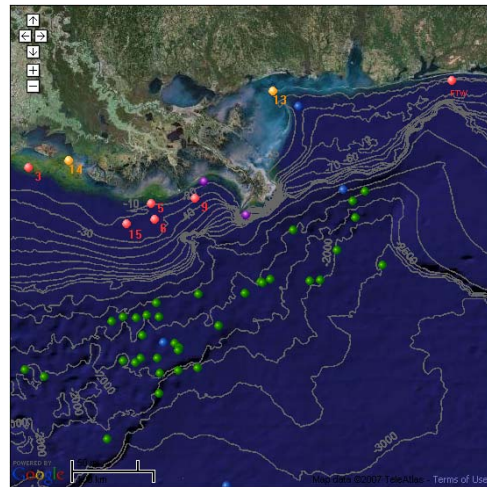
Product Type: Oceanographic Observed

Funding Source: Public

Point of Contact Information:

Coverage: Louisiana Coast

Name: Bill Gibson
Phone: 225-578-2947
Email: bgibson@lsu.edu
Web site: <http://www.wavcis.lsu.edu>



Description: WavCIS is intended to provide real-time information primarily for coastal areas of Louisiana. The WavCIS network measures meteorological data (wind speed and direction, barometric pressure, air temperature, humidity and visibility) in addition to the oceanographic measurements presented here. A comprehensive suite of met-ocean data are measured (see above) at six operational stations (red dots) along the U.S. Gulf Coast from Santa Rosa Island, FL, to south of Vermilion Bay, LA at intervals of 3 hours or less. The two stations (yellow dots) shown in the figure above provide archival data only (CSI 13 and CSI 14).

In addition to its real-time data, WavCIS provides a number of forecast models through its Web site. The goal is to provide forecasts that enable the various government and public entities to make a better-informed decision regarding their respective operational needs as they relate to the Gulf of Mexico and coastal areas of Louisiana. Its primary mission is to provide NOAA with weather and sea state conditions during the year and especially during hurricane season. Users include the State of Louisiana's Office of Emergency Preparedness and the NOAA National Hurricane Center, other federal, state and local entities, and private interests.

SAROPS Applicability: The surface current information collected by the offshore MMS stations (green stations in the above figure) are designed to fill data needs for other uses and are not useful for SAR applications. Those ADCPs are directed toward the bottom at depths of 150 ft or greater. No ADCP data for depths less than 150 ft could be found for those stations.

The WavCIS ADCPs are mounted on the sea floor bottom and are directed toward the surface. Water column bin sizes are 1 m (.5 m bins at CSI 3 only) in size and depths are 20 m or less, so the upper depth bin resolved by the instruments are reasonably valid for SAR use. Station CSI-5 makes a single measurement at a nominal 3 m depth, which is still useful for SAR use as a supplemental source of information.

The meteorological and basic wave data from all the WavCIS stations is reported by NDBC (NOAA); however, the current data is not. If combined on a regional basis, i.e., through GCOOS or NDBC, these data could be cost-effective for Coast Guard use. This product is conditionally recommended for inclusion in the SAROPS EDS.

Product Provider: Mercator-Ocean

Center / Department / Section: Customer Services

Product Name: Mercator Ocean forecasts

Parameters: Sea-surface currents	Ice cover
Ice thickness	Salinity
Sea surface/subsurface temperature	Turbulent kinetic energy

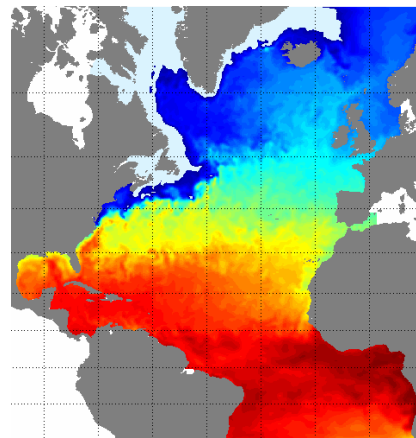
Product Type: Oceanographic Modeled

Funding Source: Public

Point of Contact Information:

Coverage: Global

Name: Vincent Toumazou
Phone: +33 5 61 39 38 02
Email: vincent.toumazou@mercator-ocean.fr
Web site: <http://www.mercator-ocean.fr/>



Description: MERCATOR OCEAN is a French public company entirely devoted to operational oceanography. Based in Toulouse, it was founded in April 2002 to lead the Mercator project and strengthen the development of an operational high resolution global ocean monitoring and forecasting capacity. MERCATOR OCEAN performs as a consortium company (GIP), supported by the six major French institutes involved in oceanography, namely CNES (Space Agency), CNRS (National Research Center), IFREMER (Research Institute for the Exploitation of the Sea), IRD (Research Institute for Development), Météo-France and SHOM (Hydrographic and Oceanographic Service of the Navy). These public organizations have been supporting the Mercator project since its beginning (1995), and created MERCATOR OCEAN in 2002 as a focal structure to take the lead of this joint initiative for operational oceanography.

As part of its activity, MERCATOR OCEAN developed a growing expertise on real time use of in-situ and remote-sensed data, which relies on as various technical and scientific competences such as data validation, development of numerical model and associated data assimilation scheme, routine operation of an ocean forecasting system, scientific validation and assessment of the system outputs to meet end-user needs.

MERCATOR OCEAN forecasters provide weekly ocean bulletins to end-users, available on www.mercator-ocean.fr, providing on a pre-operational basis a 3D high resolution (1/15°) depiction of North Atlantic and Mediterranean Sea, and starting in 2005 the first European global ocean model with a 1/4° resolution.

Mercator-Ocean lists the following four oceanographic models:

Geographic Extent	North and Tropical Atlantic (70°N–20°S)	North Atlantic (70 °N–9°N) and Mediterranean	Global	Global
Horizontal Resolution	1/3° (25–30 km)	1/15° (5–7 km)	2° (55–222 km)	¼° (6–26 km)
Vertical Resolution (levels)	43	43	31	46
Assimilated Data	Altimetry SST In situ profiles	Altimetry SST In situ profiles	Altimetry	Altimetry

SAROPS Applicability: The models are run once per week and provide forecasts for the next 14 days. This feature makes the models relatively uncompetitive with those operated by various U.S. government agencies. The Mercator-Ocean product may however be useful as an independent backup for SAR use. This product is conditionally recommended for inclusion in the SAROPS EDS.

Product Provider: National Aeronautics and Space Administration (NASA) - Marshall Space Flight Center (MSFC)

Center / Department / Section: Earth Science Office

Product Name: Sea Ice

Parameters: Ice cover

Ice type

Product Type: Oceanographic Observed

Funding Source: Public

Point of Contact Information:

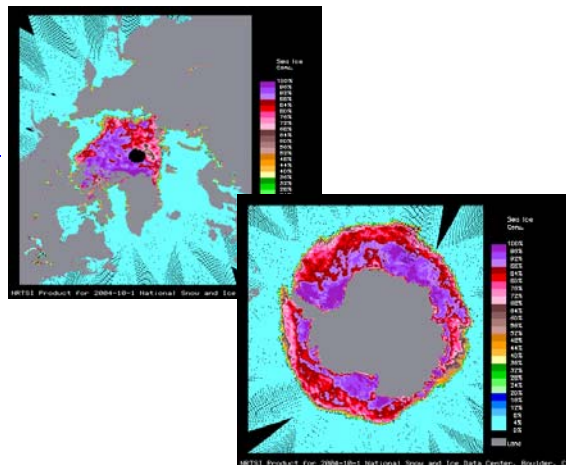
Coverage: Polar Regions

Name: Michael Goodman

Phone: 256-961-7890

Email: michael.goodman@nasa.gov

Web site: <http://www.science.nasa.gov/newhome>



Description: The Advanced Microwave Scanning Radiometer Enhanced Science Investigator-led Processing System (AMSR-E SIPS) processes AMSR-E instrument data from the NASA Aqua satellite on a routine near-real-time basis. The data center is the primary processing center with a responsibility to provide data for the NASA Science Team members. These data are available to the public but generally not through the AMSR-E SIPS (some exceptions). The publicly available data may be obtained from the National Snow and Ice Data Center (NSIDC) in Boulder, CO.

The Near Real-Time Defense Meteorological Satellite Program (DMSP) Special Sensor Microwave Imager (SSM/I) Daily Polar Gridded Sea Ice Concentration product provides a near real-time map of sea ice concentrations for both the Northern and Southern Hemispheres. Near real-time passive microwave [brightness temperatures](#) (TBs) from the DMSP F13 SSM/I are received daily from the MSFC and gridded onto the SSM/I polar stereographic grid. Sea ice concentrations are generated from these TBs using the [NASA Team](#) algorithm. Near real-time brightness temperature data are available [via ftp](#) at a resolution of 25 km for the 19, 22 and 37 GHz channels, and at 12.5-km resolution for the 85 GHz channels. NSIDC plans daily updates to the sea ice concentration data. These data will be retained on the ftp site until NSIDC's standard sea ice product, the [DMSP SSM/I Daily and Monthly Sea Ice Concentration Grids for the Polar Regions](#), becomes available. NSIDC's standard sea ice product is derived from TBs provided by Remote Sensing Systems, Inc (RSS). RSS derives the TBs from SSM/I antenna temperatures between three and six months after the initial satellite overpass. NSIDC chose to provide near real-time TBs to facilitate time-sensitive research dependent upon precise detection of seasonal polar sea ice formation and break up.

SAROPS Applicability: This satellite-derived sea ice cover product provides data that could be useful for SAR operations in polar regions. The product is better suited for characterizing ice coverage than its scores indicate. Horizontal resolution of 25 km indicates suitability for offshore use. This product might be useful for SAR operations, but is not recommended for inclusion in the SAROPS EDS.

Product Provider: National Aeronautics and Space Administration (NASA) - Marshall Space Flight Center (MSFC)

Center / Department / Section: Earth Science Office

Product Name: Sea Surface Temperature

Parameters: Sea surface/subsurface temperature

Product Type: Oceanographic Observed

Funding Source: Non-profit

Point of Contact Information:

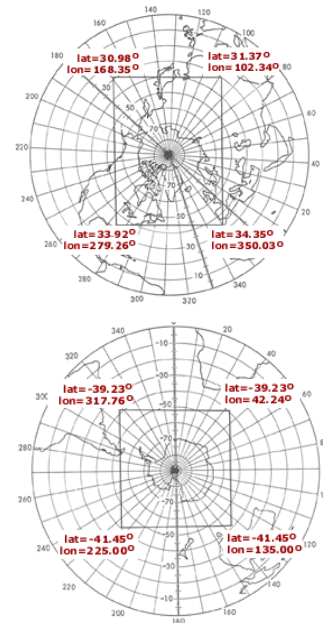
Name: Michael Goodman

Phone: 256-961-7890

Email: michael.goodman@nasa.gov

Web site: <http://www.science.nasa.gov/newhome>

Coverage: Polar Regions



Description: The Advanced Microwave Scanning Radiometer Enhanced Science Investigator-led Processing System (AMSR-E SIPS) processes AMSR-E instrument data from the NASA Aqua satellite on a routine near-real-time basis. The data center is the primary processing center with a responsibility to provide data for the NASA Science Team members. These data are available to the public but in general not through the AMSR-E SIPS (some exceptions). The publicly available data may be obtained from the National Snow and Ice Data Center in Boulder, CO.

SAROPS Applicability: This satellite-derived sea surface temperature product provides data that could be useful for SAR operations in Polar Regions. The 12-hour update for SST is probably suitable for polar areas. The >20-km resolution indicates suitability for offshore areas only for polar operations. This product is recommended for inclusion in the SAROPS EDS.

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Product Provider: National Oceanic and Atmospheric Administration (NOAA), National Environmental Satellite, Data, and Information Service (NESDIS)

Center / Department / Section: National Climatic Data Center (NCDC)

Product Name: NCDC Meteorological Modeled (NCEP)

Parameters:	Air temperature	Air temperature daily max/min	Area forecast
	Atmospheric pressure	Ceiling	Cloud layers
	Dew point	Icing layer	Icing potential
	Precipitation type/rate	Relative humidity	Summary
	Surface wind speed/gusts	Total cloud cover	Visibility
	Weather type	Wind chill	Winds at altitude

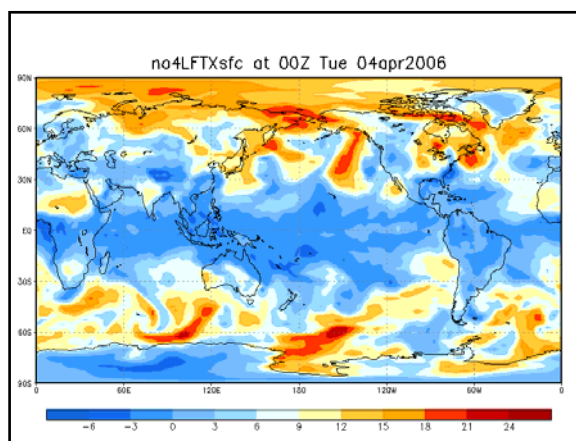
Product Type: Atmospheric Modeled

Funding Source: Public

Point of Contact Information:

Coverage: U.S. / World Wide

Name: Benjamin Watkins
Phone: 828-271-4800
Email: Benjamin.Watkins@noaa.gov
Web site: <http://www.ncdc.noaa.gov>



Description: The NOAA National Climatic Data Center (NCDC) supports access to a variety of data and information from in-situ, satellite and other remote sensing observations. NCDC supports the development of the national and global economy by providing valuable climate information to assist users in making informed decisions concerning climate applications.

NCDC receives data sets from Numerical Weather Prediction (NWP) models in real-time via the [NOAAPort Ingest System](#). The models are run at NCEP and include the Global Forecast System (GFS), the ETA Models, and the Rapid Update Cycle (RUC) Models. Plans to expand the repository include additional models (Ocean, Ensembles, etc.). The data sets contain gridded model output and are stored in [GRIB](#) format. The outputs contain analysis fields and forecast hours for multiple parameters and levels.

Data are received at NCDC where it is made available for access. The data are also archived. Typically, the archives are very large, some are available on-line, some archives need or be ordered, but the turnaround time is quick. There may be a fee associated with ordering archive data. NCDC does some QC/QA, but generally, the data are made available in the form it is received.

NCDC is a NOMADS (National Operational Model Archive and Distribution System) node, a collaborative project which focuses on a distribution system for forecast model data. Some data are available via OpenDAP; most of the data are stored in Gridded Binary (GRIB), Binary Universal Form for Representation (BUFR) or the native data format. Additionally, several tools are available that allows users to request data in certain formats such as NetCDF.

SAROPS Applicability: NOAA's NCDC is a central repository of data from different providers and as such, plays an important role in simplifying data integration for SAROPS as it represents a "one-stop shop" for different data products. This site provides useful information for USCG uses; however, it is mainly useful as a source of archival data the EDS will have from other sources. This product is not recommended for inclusion in the SAROPS EDS at this time.

Product Provider: National Oceanic and Atmospheric Administration (NOAA), National Environmental Satellite, Data, and Information Service (NESDIS)

Center / Department / Section: National Climatic Data Center (NCDC)

Product Name: NCDC Meteorological Observed

Parameters:	Air temperature	Air temperature daily max/min	Area forecast
	Atmospheric pressure	Ceiling	Cloud layers
	Dew point	Icing layer	Icing potential
	Precipitation type/rate	Relative humidity	Summary
	Surface wind speed/gusts	Total cloud cover	Visibility
	Weather Type	Wind chill	Winds at altitude

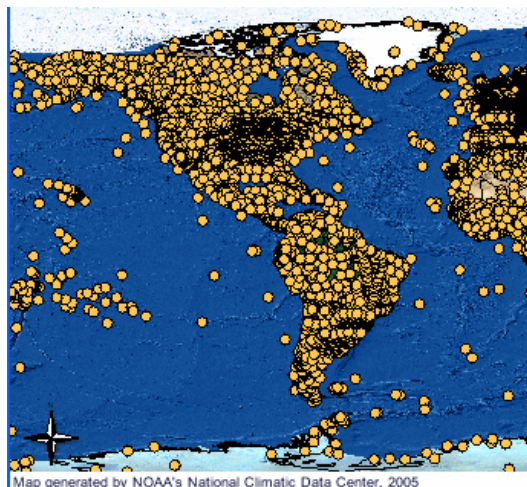
Product Type: Atmospheric Observed

Funding Source: Public

Point of Contact Information:

Coverage: U.S. / World Wide

Name: Benjamin Watkins
Phone: 828-271-4800
Email: Benjamin.Watkins@noaa.gov
Web site: <http://www.ncdc.noaa.gov>



Description: The National Climatic Data Center (NCDC) supports access to the variety of data and information originating from in-situ, satellite and other remote sensing observations.

Data can be accessed at the following Web address: <http://www.ncdc.noaa.gov>

NCDC collects, centralizes, and archives meteorological observation data collected by other NOAA groups, such as NDBC.

SAROPS Applicability: NCDC is a central repository of data from different providers and as such, plays an important role in simplifying data integration for SAROPS as it represents a “one-stop shop” for different data products. For real-time meteorological observations, NDBC may provide more timely data; NCDC provides long-term archive capabilities. Because it essentially replicates the SAROPS EDS as a source of archival data, it is not recommended for inclusion in the SAROPS EDS.

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Product Provider: National Oceanic and Atmospheric Administration (NOAA), National Environmental Satellite, Data, and Information Service (NESDIS)

Center / Department / Section: National Climatic Data Center (NCDC)

Product Name: NCDC Ocean Observed

Parameters:	Ice cover	Ice type
	Sea surface/subsurface temperature	Wave direction
	Wave max height	Wave peak period
	Wave significant height	

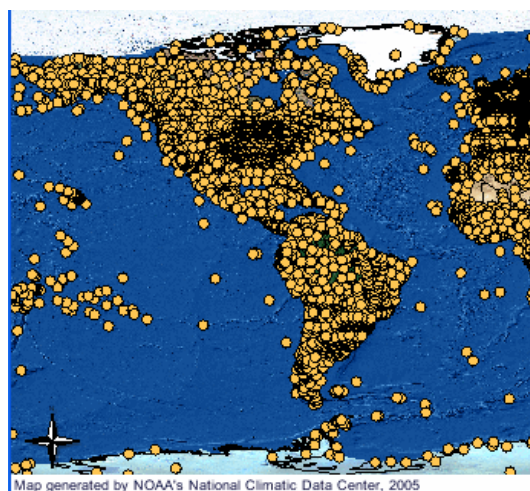
Product Type: Oceanographic Observed

Funding Source: Public

Point of Contact Information:

Coverage: U.S. / World Wide

Name: Benjamin Watkins
Phone: 828-271-4800
Email: Benjamin.Watkins@noaa.gov
Web site: <http://www.ncdc.noaa.gov>



Description: The National Climatic Data Center (NCDC) supports access to the variety of data and information originating from in-situ, satellite and other remote sensing observations.

Data can be accessed at the following Web address: <http://www.ncdc.noaa.gov>

NCDC collects, centralizes, and archives oceanographic observation data collected by other NOAA groups, such as NDBC and NOS.

SAROPS Applicability: NCDC represents a “one-stop shop” for different data products. Because it duplicates the SAROPS EDS as a source of archival data, this product is not recommended for inclusion in the SAROPS EDS.

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Product Provider: National Oceanic and Atmospheric Administration (NOAA), National Environmental Satellite, Data, and Information Service (NESDIS)

Center / Department / Section: National Data Buoy Center (NDBC)

Product Name: NDBC Meteorological Buoys

Parameters: Air temperature	Air temperature daily max/min	Dew point
Icing potential	Surface wind speed/gusts	Visibility
Wind chill		

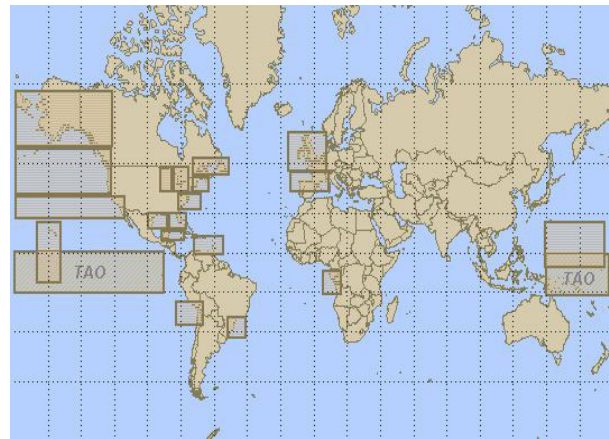
Product Type: Atmospheric Observed

Funding Source: Public

Point of Contact Information:

Name: Stephen Cucullu
Phone: 228-688-3804
Email: Stephen.Cucullu@noaa.gov
Web site: <http://www.ndbc.noaa.gov>

Coverage: Different sub-regions



Description: The National Data Buoy Center (NDBC) is part of NOAA's National Weather Service (NWS). NDBC designs, develops, operates, and maintains a network of data collecting buoys and coastal stations.

NDBC is a central repository and distribution center of meteorological data for NDBC buoy information, CMAN buoy information, and various university programs

NDBC has a long history of providing operational data, and their Web site manages 20 million hits a month, typically from offshore oil dispatchers, commercial fisherman, surfers, and public users.

NDBC maintains a large data archive. Almost all of the data are available in simple ASCII files. Parameter measurements for all NDBC stations are available in single files and almost all station data are posted by 20 minutes past the hour. The files are available via FTP access, but NDBC also are working on OPeNDAP server access. They also provide the archive data to NODC & NCDC. They work closely with NCDDC where FGDC-standard metadata is available for each station. NCDDC also maintain a map server application to show the NDBC stations.

SAROPS Applicability: NDBC has a strong infrastructure and QA/QC program and provide central distribution of a variety of observation data that can be ingested by SAROPS.

Because the observations are irregularly spaced, this product is only useful as a supplementary information source at present. Because the data set is so extensive, the system is recommended for inclusion in the SAROPS EDS.

Product Provider: National Oceanic and Atmospheric Administration (NOAA), National Environmental Satellite, Data, and Information Service (NESDIS)

Center / Department / Section: National Data Buoy Center (NDBC)

Product Name: NDBC Oceanographic buoys

Parameters:	Sea-surface currents	Sea surface/subsurface temperature
	Water level	Wave peak period
	Wave significant height	

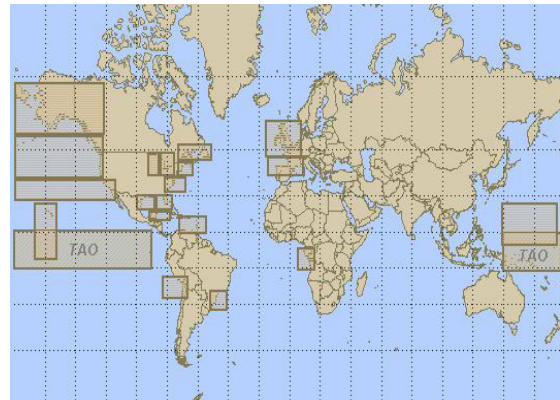
Product Type: Oceanographic Observed

Funding Source: Public

Point of Contact Information:

Name: Stephen Cucullu
Phone: 228-688-3804
Email: Stephen.Cucullu@noaa.gov
Web site: <http://www.ndbc.noaa.gov>

Coverage: Different sub-regions



Description: The National Data Buoy Center (NDBC) is part of NOAA's National Weather Service (NWS). NDBC designs, develops, operates, and maintains a network of data collecting buoys and coastal stations. Historically, NDBC has primarily provided meteorological data, but they provide oceanographic data. NDBC is a central repository and distribution center for:

- NOS PORTS and NWLON stations (winds, air temperature, sea level pressure)
- Various university programs
- The MMS ADCP network deployed by oil companies on rigs in the Gulf of Mexico
- NDBC buoys with surface current measurements

NDBC has a long history of operational data supply and their Web site manages 20 million hits a month, typically from offshore oil dispatchers, commercial fisherman, surfers, and public users.

NDBC maintains a large data archive of data collected from different ocean buoys.

NDBC is also beginning to make surface current measurements from their NDBC buoys with some reliability. Six of the NDBC buoys now measure surface currents and they have received 75% of the data expected over the last 6 months (a comparable statistics for meteorological data is about 85%). Sixty-two of the NDBC buoys will ultimately have this capability and the others will have Acoustic Doppler Current Profilers (ADCPs). The other parameters are available from all buoys.

Almost all of the data are available in simple American Standard Code for Information Interchange (ASCII) files. Parameter measurements for all NDBC stations are available in a single file and almost all station data are posted by 20 minutes past the hour. The files are available via File Transfer Protocol (FTP) and Hypertext Transfer Protocol (HTTP) access, but NDBC is also working on OPeNDAP server access. They also provide the archive data to NODC & NCDC. They work closely with NCDDC where Federal Geographic Data Committee (FGDC) standard metadata is available for each station. NCDDC also maintains a map server application to show the NDBC stations.

Future plans at NDBC include the use of RD Instruments (RDI) software to perform QA/QC analyses on the ADCP data, distribution of the Texas A&M buoy data (TABS), and they have also undertaken the Deep Ocean Assessment and Reporting of Tsunamis (DART) Project to improve the capability for the early detection and real-time reporting of tsunamis in the open ocean.

SAROPS Applicability: NDBC has a strong infrastructure and QA/QC program and provides central distribution of a variety of oceanographic observation data that could be ingested by SAROPS. The low domain, applicability and resolution score reflects the spacing of the buoy sites. The number of buoys that can measure currents is small, and many of these buoys are configured to only measure deep currents. Because many of the buoys might provide the only direct measurements of ocean properties in their areas, this product is recommended for inclusion in the SAROPS EDS.

Product Provider: National Oceanic and Atmospheric Administration (NOAA), National Environmental Satellite, Data, and Information Service (NESDIS)

Center / Department / Section: National Climatic Data Center (NCDC)

Product Name: Sea Surface Temperature

Parameters: Sea surface/subsurface temperature

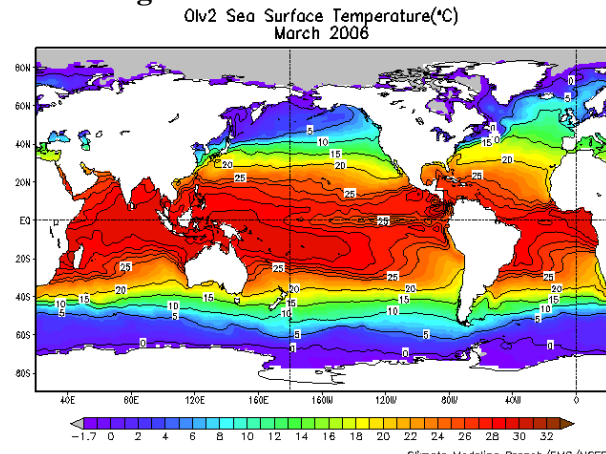
Product Type: Oceanographic Observed

Funding Source: Public

Point of Contact Information:

Name: Richard Reynolds
Phone: 828-271-4302
Email: Richard.W.Reynolds@noaa.gov
Web site: <http://polar.ncep.noaa.gov/sst/>

Coverage: Global



Description: This product is a daily analysis of sea surface temperature on a global grid. Dr. Reynolds combines satellite-derived data (infrared and microwave) and in-situ observations to provide SST maps on a 0.25-degree global grid.

The algorithm weights the data based on spatial error covariance's and noise to signal ratios:

- Infrared, high-resolution coverage; there are no retrievals under clouds
- Microwave is not affected by cloud cover, just precipitation; there are no retrievals within 50 km of land
- Sparse but high-quality in-situ measurements

The analysis provides a daily averaged field. Analyses from 1985 to present are available from <http://www.ncdc.noaa.gov/oa/climate/research/sst/oi-daily.php>. The operational product is provided as a daily-averaged field every day. The data are in NetCDF, CF compliant, and include error estimates.

SAROPS Applicability: The output format will make the integration of this product into SAROPS relatively straightforward when it becomes operational. This product, with a 1-day data lag, and relatively coarse spatial resolution, is not recommended for inclusion in the SAROPS EDS at this time.

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Product Provider: National Oceanic and Atmospheric Administration (NOAA)

Center / Department / Section: National Environmental Satellite, Data, and Information Service (NESDIS), National Oceanographic Data Center (NODC), Satellite Oceanography Group

Product Name: Advanced Very High Resolution Radiometer (AVHRR) Pathfinder Sea Surface Temperature

Parameters: Sea surface/subsurface temperature

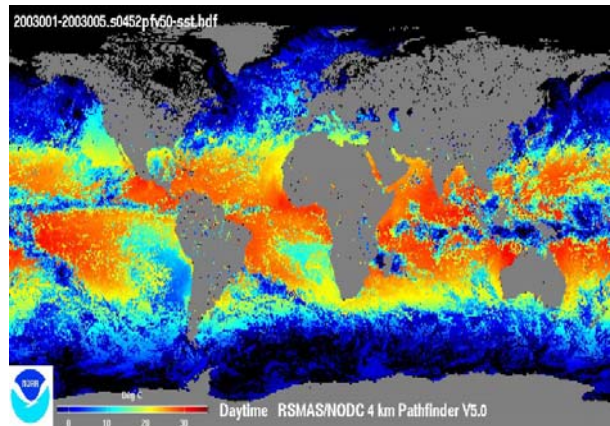
Product Type: Oceanographic Observed

Funding Source: Public

Point of Contact Information:

Coverage: Global

Name: Kenneth Casey
Phone: 301-713-3272
Email: kenneth.casey@noaa.gov
Web site: <http://www.nodc.noaa.gov>
<http://pathfinder.nodc.noaa.gov>



Description: The 4 km Pathfinder effort at NODC and the University of Miami's Rosenstiel School of Marine and Atmospheric Science (RSMAS) is an extension of and improvement on the sea surface temperature (SST) fields from the older NOAA/NASA AVHRR Oceans Pathfinder project. These new Version 5.0 data are being developed at RSMAS and NODC and distributed in partnership with the NASA Physical Oceanography Distributed Active Archive Center (PO.DAAC). In this 4 km Pathfinder project, some important shortcomings in the old 9 km data have been corrected and the entire 1985-2001 time series was reprocessed at the 4 km Global Area Coverage (GAC) level, the highest resolution possible globally. Formal Pathfinder data for the year 2003 have also recently been added, and interim data for 2002 and 2005 through near present have also been generated. All of these data are available through NODC's ftp, http, and OPeNDAP access systems.

SAROPS Applicability: This data product is not available in real-time and is not directly applicable for SAROPS. It has a large data lag and a low update rate. This product is not recommended for inclusion in the SAROPS EDS.

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Product Provider: National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS)

Center / Department / Section: Center for Operational Oceanographic Products and Services (CO-OPS)

Product Name: Operational Coastal Models

Parameters: Salinity	Sea-surface currents
Sea surface/subsurface temperature	Water level

Product Type: Oceanographic Modeled

Funding Source: Public

Point of Contact Information:

Coverage: Chesapeake Bay

Name: Dr. Mark Vincent

New York Harbor

Phone: 301-713-2890 x 151

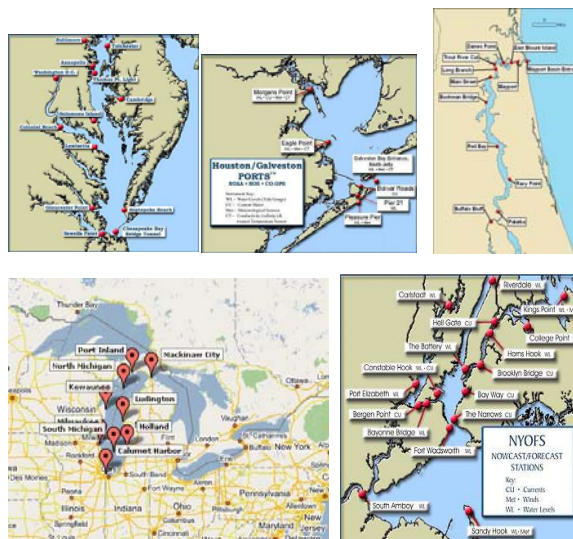
Galveston Bay

Email: Mark.Vincent@noaa.gov

St. Johns River (FL)

Web site: <http://www.tidesandcurrents.noaa.gov/models.html>

Great Lakes



Description: The NOAA/NOS Center for Operational Oceanographic Products and Services currently provides operational models for the following:

- Chesapeake Bay – an older 2D model provides water level and vertically-averaged current predictions. Plans are in place to set up a 3D Regional Ocean Modeling System (ROMS) model to provide surface current predictions.
- New York Harbor – the 3D Princeton Ocean Model (POM) provides currents. No baroclinic forcing, no temperature or salinity predictions are provided. This model features a nested grid implementation.
- Galveston Bay – the 3D POM provides currents, temperature, and salinity; the model has more advanced data assimilation which incorporates a nowcasting initialization based on density fields.

- St. Johns River (Florida) – the 3D Environmental Fluid Dynamics Code (EFDC) provides currents, temperature and salinity.
- And all 5 Great Lakes – the 3D POM provides currents and temperature. No Salinity.

Data assimilation is performed only via the boundary condition initialization (except for Galveston which is slightly more advanced), but CO-OPS does perform extensive skill assessment testing against quality targets. For example, “are water level predictions within 6 inches 90% of the time?”, and “do currents match timing of peaks and slack timing?”

CO-OPS performs these analyses on all models before they become operational, but not on an on-going basis. They plan to add this as a daily process in the future.

They have a sophisticated IT and support infrastructure where data are available in CF-compliant NetCDF via OpenDAP and all the models have a standard wrapper so they all produce the same NetCDF files. All vector positions are normalized to the center of grid, and they provide consistent u and v components. They have experience supporting emergency response activities through their activities with NOAA/Hazmat, and are well suited to support the USCG with operational model data.

The long-term plan is for complete national coverage with a combination of NCEP HYCOM simulations and nested models, probably ROMS. They have a list of regional areas that will be tackled based on funding and priority. They welcome USCG comments on areas of high interest. They also plan to move the operational model computing to NCEP, which guarantees 99.8% availability.

SAROPS Applicability: This series of high resolution operational forecast models are very useful as a source of high-resolution current forecasts, especially as more regions are added. This site ranked very well in all categories. The data are available in a format that is readily useable by SAROPS. This product is recommended for inclusion in the SAROPS EDS.

Product Provider: National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS)

Center / Department / Section: Center for Oceanographic Products and Services/Physical Oceanographic Real-Time Systems (CO-OPS/PORTS)

Product Name: PORTS Surface Current Data

Parameters: Salinity	Sea-surface currents
Sea surface/subsurface temperature	Water level

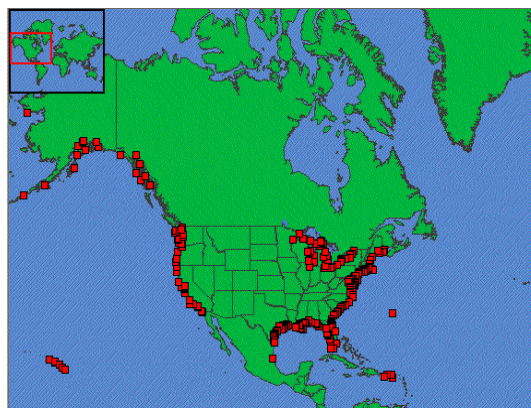
Product Type: Oceanographic Observed

Funding Source: Public

Point of Contact Information:

Coverage: United States in-situ

Name: Peter Stone
Phone: 301-713-2890 x149
Email: peter.stone@noaa.gov
Web site: <http://tidesandcurrents.noaa.gov/>



Description: The National Ocean Service (NOS) Center for Operational Oceanographic Products and Services (CO-OPS) collects and distributes observations and predictions of water levels and currents to ensure safe, efficient and environmentally sound maritime commerce. The Center provides the set of water level and coastal current products required to support NOS' Strategic Plan mission requirements, and to assist in providing operational oceanographic data/products required by NOAA's other Strategic Plan themes. For example, CO-OPS provides data and products required by the National Weather Service to meet its flood and tsunami warning responsibilities. The Center manages the National Water Level Observation Network (NWLON), and the national network of Physical Oceanographic Real-Time Systems (PORTS) in major U.S. harbors. The Center establishes standards for the collection and processing of water level and current data, collects and documents user requirements, which serve as the foundation for all resulting program activities, designs new and/or improved oceanographic observing systems, designs software to improve CO-OPS' data processing capabilities, maintains and operates oceanographic observing systems, performs operational data analysis/quality control, and produces/disseminates oceanographic products.

The main product discussed in this analysis is the PORTS (Physical Oceanographic Real-Time Systems) system for 13 estuaries:

[San Francisco Bay](#)

[Tampa Bay](#)

[Soo Locks](#)

[Tacoma](#)

[Lower Columbia River](#)

[New York/New Jersey Harbor](#)

[Chesapeake Bay](#)

[Los Angeles/Long Beach](#)

[Port of Anchorage](#)

[Houston/ Galveston](#)

[Narragansett Bay](#)

[Delaware River and Bay](#)

[New Haven](#)

The PORTS implementation consists of a water level network with approximately 187 stations. Many of the stations also have meteorological data measured at 10m although some are on bridges so may not be at 10m. They are also expanding the PORTS system with an additional 4 ports in the Gulf of Mexico in the next 12-18 months. The data collection frequency ranges from 6 minutes to 3 hours, and it is variable so it may be increased during events such as storms. Aside from the NOS buoys, they also ingest and distribute data from regional groups such as Texas Coastal Ocean Observation Network (TCOON), Florida Department of Environmental Protection, and Southeast Atlantic Coastal Ocean Observing System (SEACOOS). Data are available in the PORTS Uniform Flat File Format (PUFFS) and is easily readable.

NOS/CO-OPS also manages the National Water Level Program (NWLP) and the National Water Level Observation Network (NWLON). The NWLON is a network of 175 long-term, with expansion to 200 stations by next year, continuously operating water-level stations throughout the USA, including its island possessions and territories and the Great Lakes. NWLON stations are the foundation for reference stations for NOAA's tide prediction products, and serve as controls in determining tidal datums for all short-term water-level stations. Technological advancements in sensors, data collection and data communications have enabled routine real-time automated and event-driven data acquisition using the GOES satellite. NWLON data-collection platforms are now capable of measuring other oceanographic parameters in addition to water levels, including meteorological parameters.

The NOS goal is to be the central distribution center for surface currents and elevation data, both from their network as well as from universities and regional associations. The meteorological data that they collect is distributed to NDBC for distribution to NWS.

SAROPS Applicability: NOS has a sophisticated infrastructure for managing and distributing a variety of oceanographic observation data. In addition to data from their own buoys, they act as a clearing house of data from regional providers. This product is highly rated in all categories, even though its spatial extent is limited. The system provides current data that would be useful for SAR in only a few locations; however, the water level, sea surface temperature, and associated meteorological data are useful for these areas. This product is recommended for inclusion in the SAROPS EDS.

Product Provider: National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS)

Center / Department / Section: CoastWatch/Great Lakes Environmental Research Laboratory (GLERL)

Product Name: CoastWatch Great Lakes Node Meteorological Observations

Parameters: Surface wind speed/gusts

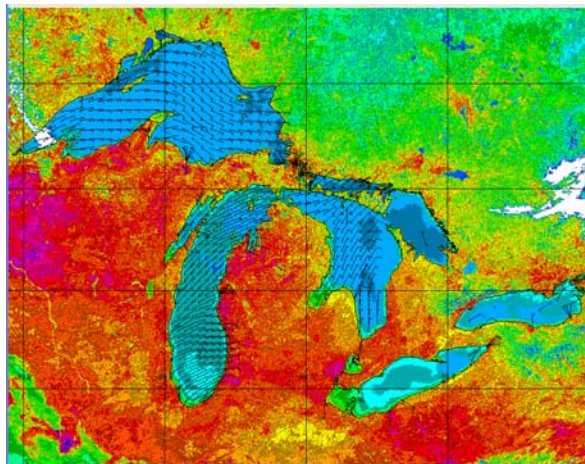
Product Type: Atmospheric Observed

Funding Source: Public

Point of Contact Information:

Name: George Leshkevich
Phone: 734-741-2265
Email: George.Leshkevich@noaa.gov
Web site: <http://coastwatch.glerl.noaa.gov/>

Coverage: Great Lakes



Description: The Great Lakes Environmental Research Laboratory (GLERL) functions as the Great Lakes regional node for the NOAA Coast Watch Program. GLERL obtains, produces, and delivers environmental data and products for near real-time observation of the Great Lakes to support environmental science, decision-making, and supporting-research. NOAA's CoastWatch Program makes data and imagery available from a variety of sensors and satellites. The most commonly requested data are sea surface temperature, ocean surface winds, and ocean color.

CoastWatch/Great Lakes Node concentrates mainly on satellite and other remotely-sensed data, but additionally, NDBC, C-Man, NOS water level and Canadian Stations. Additionally, model/predicted data are also ingested from the Great Lakes Coastal Forecasting Systems (GLCFS) and redistributed as waves, currents and winds.

CoastWatch provides near real-time ocean surface wind products with data from the QuikSCAT satellite and the Defense Meteorological Satellite Program (DMSP). Although the surface wind products appear similar, each product has unique characteristics dependent on sensor characteristics and wind derivation methods. The QuikSCAT products use color as well as wind-barb notation to depict velocity (wind speed and direction); while the DMSP special sensor microwave imager products show only wind speed. Currently, the Coastwatch products are to be considered 50% research and 50% operational, although they are operationally focused.

SAROPS Applicability: This site redistributes information from other sources and is not recommended for SAROPS EDS.

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Product Provider: National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS)

Center / Department / Section: CoastWatch/Great Lakes Environmental Research Laboratory (GLERL)

Product Name: CoastWatch Great Lakes Node Oceanographic Observations

Parameters: Ice cover	Ice type	Ice thickness
Sea surface/subsurface temperature	Water level	

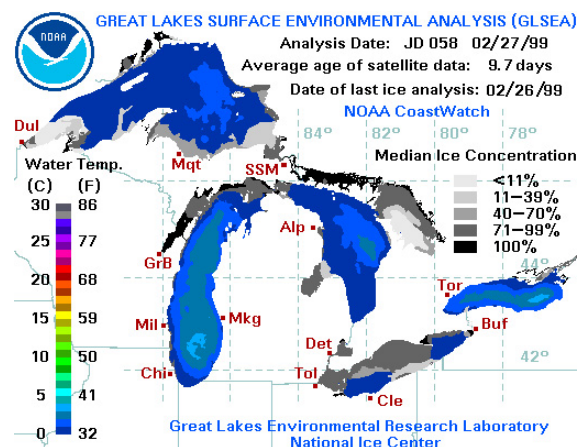
Product Type: Oceanographic Observed

Funding Source: Public

Point of Contact Information:

Name: George Leshkevich
Phone: 734-741-2265
Email: George.Leshkevich@noaa.gov
Web site: <http://coastwatch.glerl.noaa.gov/>

Coverage: Great Lakes



Description: The Great Lakes Environmental Research Laboratory (GLERL) functions as the Great Lakes regional node for the NOAA Coast Watch Program. GLERL obtains, produces, and delivers environmental data and products for near real-time observation of the Great Lakes to support environmental science, decision-making, and supporting-research. NOAA's CoastWatch Program makes data and imagery available from a variety of sensors and satellites. The most commonly requested data are sea surface temperature, ocean surface winds, and ocean color.

CoastWatch/Great Lakes Node concentrates mainly on satellite and other remotely-sensed data, but additionally, NDBC, C-Man, NOS water level and Canadian Stations. Additionally, model/predicted data are also ingested from GLCFS and redistributed as waves, currents and winds.

CoastWatch provides near real-time water surface wind products with data from the QuikSCAT satellite and the Defense Meteorological Satellite Program (DMSP). Although the ocean surface wind products appear similar, each product has unique characteristics dependent on sensor characteristics and wind derivation methods. The QuikSCAT products use color as well as wind-barb notation to depict velocity (wind speed and direction), while the DMSP special sensor microwave imager products show only wind speed. Currently, the Coastwatch products are to be considered 50% research and 50% operational, although they are operationally focused.

SAROPS Applicability: This site redistributes information from other sources and is not recommended for inclusion in the SAROPS EDS.

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Product Provider: National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS)

Center / Department / Section: Estuarine Research Reserve Division

Product Name: National Estuarine Research Reserve System System-Wide Monitoring Program: NERRS SWMP

Parameters: Atmospheric pressure
Air temperature daily max/min
Relative humidity

Air temperature
Precipitation type/rate
Surface wind speed/gusts

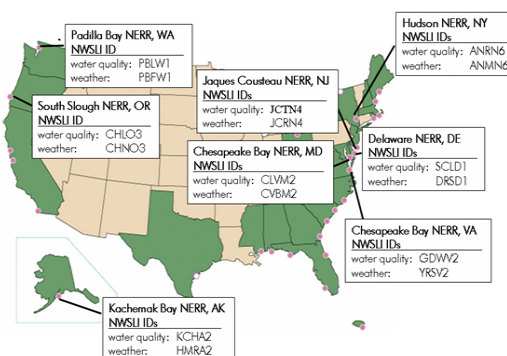
Product Type: Atmospheric Observed

Funding Source: Public

Point of Contact Information:

Name: Beth Ebersole
Phone: 301-713-3155 x173
Email: Beth.Ebersole@noaa.gov
Web site: <http://cdmo.baruch.sc.edu/>

Coverage: Various Coastal Areas



Description: The National Estuarine Research Reserves System (NERRS) is a network of 26 reserves (27th added in Texas in 2006) established for monitoring, research, education and coastal stewardship. The reserve system has collected water quality, weather, and some biological data since 1985. The reserve system is part of the System-Wide Monitoring Program (SWMP), which had been identified as a backbone element of NOAA's IOOS program. The decision was made to make NERRS data available in real-time and consistent with IOOS Data Management and Communication (DMAC) standards.

The NERRS/SWMP tracks both short-term variability and long-term changes in estuaries and coastal areas. Parameters measured include wind speed and direction, air and water temperature, and turbidity. Telemetry equipment on data loggers at eight reserves provides near real-time data for a variety of purposes, including weather forecasts, fisheries, stewardship and transportation. All 27 reserves are slotted to have telemetry. The program also provides valuable archived long-term data at high frequency time intervals (every 15 to 30 minutes).

On average the NERRS/SWMP annually collects at least 13.5 million water quality data points, 34.4 million meteorological data points and 31,104 nutrient data points. Monitoring data for each reserve are available from the reserve system's Centralized Data Management Office housed at the North Inlet-Winyah Bay NERR in South Carolina (<http://cdmo.baruch.sc.edu/> or at the NOAA National Weather Service Hydro-meteorological Automated Data System Web site, <http://www.nws.noaa.gov/oh/hads/>).

A map showing the sites that are now on-line for real time data can be viewed at http://nerrs.noaa.gov/ioos/realtime_map.html.

SAROPS Applicability: A network of in-situ meteorological observation data is useful for SAR planning, both as a direct source of inputs to drift calculations and as input for validation and meteorological model predictions. The program has a long history of collecting and distributing observation data and should be relatively easy to integrate into SAROPS. The addition of real-time access to all 27 reserves will enhance the product. The product's collection, archival, and QA processes are relatively good. Sampling locations and the sparse spatial density of stations make this source usable as a supplement to other products for USCG and SAR use. For areas where other sources of data are sparse, this product is conditionally recommended for inclusion in the SAROPS EDS.

Product Provider: National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS)

Center / Department / Section: Estuarine Research Reserve Division

Product Name: National Estuarine Research Reserve System System-Wide Monitoring Program: NERRS SWMP

Parameters: Salinity Turbidity	Sea surface/subsurface temperature
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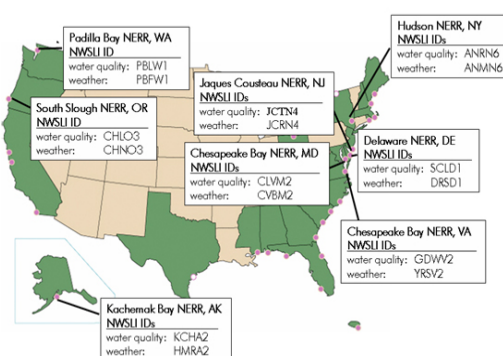
Product Type: Oceanographic Observed

Funding Source: Public

Point of Contact Information:

Name: Beth Ebersole
Phone: 301-713-3155 x173
Email: Beth.Ebersole@noaa.gov
Web site: <http://cdmo.baruch.sc.edu/>

Coverage: Various Coastal Areas



Description: The National Estuarine Research Reserves System (NERRS) is a network of 26 reserves (27th added in Texas in 2006) established for monitoring, research, education and coastal stewardship. The reserve system has collected water quality, weather, and some biological data since 1985. These data, part of the System-Wide Monitoring Program (SWMP), are used by researchers, educators, coastal zone management (CZM) programmers, and others. With the recent establishment of the Integrated Ocean Observing System (IOOS), SWMP was identified as a backbone element of NOAA's IOOS program. The decision was made to make NERRS data available in real-time and consistent with IOOS Data Management and Communication (DMAC) standards.

The NERRS/SWMP tracks both short-term variability and long-term changes in estuaries and coastal systems. Parameters measured include wind speed and direction, air and water temperature, and turbidity. Telemetry equipment on data loggers at eight reserves provides near real-time data for a variety of purposes, including weather forecasts, fisheries, stewardship and transportation. All 27 reserves are slotted to have telemetry. The program also provides valuable archived long-term data at high frequency time intervals (every 15 to 30 minutes).

On average the NERRS/SWMP annually collects at least 13.5 million water quality data points, 34.4 million meteorological data points and 31,104 nutrient data points. Monitoring data for each reserve are available from the reserve system's Centralized Data Management Office housed at the North Inlet-Winyah Bay NERR in South Carolina (<http://cdmo.baruch.sc.edu/>) or at the NOAA National Weather Service Hydro-meteorological Automated Data System Web site: <http://www.nws.noaa.gov/oh/hads/>).

A map showing the sites that are now on-line for real time data can be viewed at:
http://nerers.noaa.gov/ioos/realtime_map.html.

SAROPS Applicability: The parameters collected are not of primary importance for SAR planning, although they play a role in understanding the overall environmental conditions for the local region. The product's collection, archival, and QA processes are relatively good. Sampling locations and the sparse spatial density of stations make this source usable as a supplement to other products for USCG and SAR use. This product is conditionally recommended for inclusion in the SAROPS EDS for areas where other sources of data are sparse.

Product Provider: National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS)

Center / Department / Section: Office of Coast Survey (OCS)/ Coast Survey Development Laboratory (CSDL)

Product Name: Chesapeake Bay Model

Parameters: River discharge	Salinity
Sea-surface currents	Sea surface/subsurface temperature
Turbulent dispersion coefficient	Water level

Product Type: Oceanographic Modeled

Funding Source: Public

Point of Contact Information:

Coverage: Chesapeake Bay

Name: Tom Gross

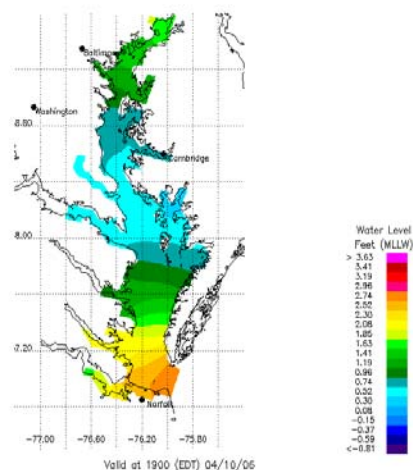
Phone: 301-713-2809

Email: tom.gross@noaa.gov

Web site:

<http://tidesandcurrents.noaa.gov/ofs/cbofs/cbofs.html>

<http://nauticalcharts.noaa.gov/csdl/op/c3po.html>



Description: The Chesapeake Bay Operational Forecast System runs a numerical model four times a day to simulate water levels for the last 24 hours ([Nowcast](#)) and produce a [forecast](#) of the water levels for the next 24 hours. These figures display the results as a graph of the water level height at water level measurement stations throughout the bay. All the graphics are updated with each new run of the model which occurs daily at 0100, 0700, 1300, 1900 Eastern Standard Time. The model also provides vertically averaged currents.

The model is an improvement over the Tide Tables, which use only historical data to predict the tides. In addition to the tides, the model includes water level deviations in the Bay caused by wind and ocean water level changes. National Weather Service forecast models provide predicted wind and ocean water level allowing the model to make predictions of changes in the Bay water level for the next 24 hours.

The CBOFS water level Nowcasts and forecasts are accurate to within 6 inches 90% of the time. Occasional very large high or low water level events may cause greater errors. Even during extreme events the timing and tendency toward water level rise or fall are often correct, although the amplitude of the error may be greater than 6 inches. A detailed analysis of the accuracy of the CBOFS system can be found in CBOFS Skill Assessment 2000.

SAROPS Applicability: During this project, the Chesapeake Bay model adopted the 3-D finite element C3PO implementation of the Quoddy model. It is fully 3D, using an unstructured triangular horizontal grid and sigma vertical coordinate system (9700 nodes, 17925 elements, 15 layers). Baroclinic circulation is modeled with full salinity and temperature fields. The model uses real time data for surface wind forcing and to prescribe the non-tidal water level height at the mouth of the bay, similar to the former 2-D CBOFS. River inputs from the USGS gauges control the estuarine circulation. Oceanic boundary conditions for salinity and temperature are monthly climatology. A Mellor Yamada level 2.5 turbulence closure scheme is used, but will be replaced by a k-omega or k-epsilon turbulence closure scheme in the near future.

This model product is of great value to SAR operations as it resolves surface currents at a high spatial resolution in a busy estuary. The Web site indicates that current predictions are also available. These are vertically averaged columns, which lowers the utility of the product for USCG SAR use somewhat. These data are published in a format that would make it readily accessible by SAROPS. This product compares well against the operational criteria. Its temporal and spatial resolutions are also very good. The model does not appear to be fully operational, but is recommended for inclusion in the SAROPS EDS.

Product Provider: National Oceanic and Atmospheric Administration (NOAA), National Weather Service (NWS)

Center / Department / Section: NWS Digital Services Project Team

Product Name: National Digital Forecast Database (NDFD)

Parameters:	Total cloud cover	Icing potential	Precipitation type/rate
	Relative humidity	Air temperature	Air temperature daily max/min
	Dew point	Wind chill	Visibility
	Weather type	Surface wind speed/gusts	

Product Type: Atmospheric Modeled

Funding Source: Public

Point of Contact Information:

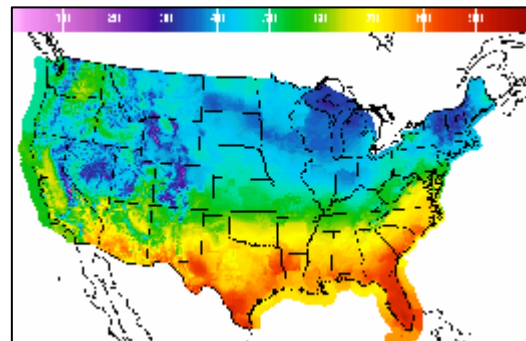
Coverage: CONUS, Hawaii, Puerto Rico, Guam

Name: Robert Thompson

Phone:

Email: robert.thompson@noaa.gov

Web site: <http://www.weather.gov/forecast>



Description: Please refer to the following Web page for a more thorough discussion of the National Digital Forecast Database: <http://www.weather.gov/ndfd/>

Based on digital forecasts from NWS field offices working with NCEP, the database includes current gridded forecasts of weather elements (temperature, etc.). The NDFD is updated hourly, and the data are available for projections every three hours. Projection intervals vary by element type and projection length. For example, temperature projections are made every 3 hours out to 72 hours, every 6 hours out to 168 hours. Precipitation amount is provided every 6 hours out to 72 hours.

NWS plans to expand the available elements and provide more graphical presentations. Status of individual elements varies with location, with nine elements operational. Two were to become operational in May 2007, and five experimental in the continental U.S. The elements are also operational in Puerto Rico, Hawaii, and Guam. No elements in Alaska have operational status, while five have experimental status.

SAROPS Applicability: This product provides detailed coverage of weather conditions on a national level, presently at a 3-hour time step and a 5-km spatial grid. Coverage includes all coastal regions. The product is created by operators at NWS Weather Forecast Offices nationwide, and is considered operational. Step changes in parameter values can periodically be seen between WFO areas that can be rectified by smoothing. Future improvements to the product are envisioned that include increasing the forecast time step to 1 hour. We could not find the

“Icing potential” and “Visibility” parameters. This product is highly recommended for incorporation into the SAROPS EDS.

Product Provider: National Oceanic and Atmospheric Administration (NOAA), National Weather Service (NWS)

Center / Department / Section: Environmental Modeling Center (EMC)

Product Name: Real-Time Ocean Forecast System (RTOFS)

Parameters:	Sea-surface currents	Salinity	Sea surface/subsurface temperature
	Water level		

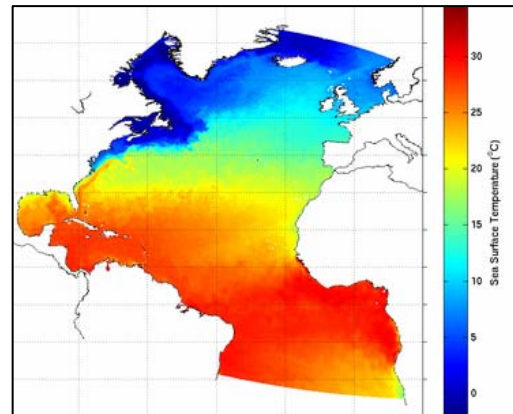
Product Type: Oceanographic Modeled

Funding Source: Public

Point of Contact Information:

Name: Carlos Lozano
Phone:
Email: carlos.lozano@noaa.gov
Web site: <http://polar.ncep.noaa.gov/ofs>

Coverage:



Description: The Web site provides graphics of nowcasts and forecasts for temperature, surface height, salinity, and currents. Forecasts are for 24, 48, 72, 96, and 120 hours. In addition, model data can be downloaded.

Model data are updated and available daily after 1400 UTC (0900 EST). Nowcast/forecast graphical products are available around 1700 UTC (1200 EST).

Model data (in GRIB format) for the latest runs is available at the following URLs:

NCEP Central Operations Production FTP server (yesterday and today):

<ftp://ftpprd.ncep.noaa.gov/pub/data/nccf/com/ofs/prod/>

NOMADS (DGS/DODS) (09/07/06 and after, with some gaps, lat/lon and native grid)

http://nomads6.ncdc.noaa.gov/ncep_data/index.html

Several sub-regions (surface fields, interpolated to lat/lon grid) are also available through the NOMADS server.

HYCOM is the dynamic ocean model used in RTOFS (Atlantic). While RTOFS is an operational model, NOAA/NWS/NCEP/EMC does not guarantee either the timeliness or the accuracy of the model results.

SAROPS Applicability: This product evaluated well against the USCG criteria. This product is conditionally recommended for inclusion in the SAROPS EDS.

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Product Provider: National Oceanic and Atmospheric Administration (NOAA), National Weather Service (NWS)

Center / Department / Section: National Centers for Environmental Prediction (NCEP), Environmental Modeling Center (EMC) Mesoscale Modeling Branch

Product Name: North American Mesoscale (NAM) Model Guidance Products

Parameters:	Atmospheric pressure	Cloud layers	Ceiling
	Total cloud cover	Icing potential	Icing layer
	Precipitation type/rate	Relative humidity	Air temperature
	Air temp daily max/min	Dew point	Wind chill
	Visibility	Weather type	Surface wind speed/gusts
	Wind stress	Winds at altitude	Wind turbulent kinetic energy

Product Type: Atmospheric Modeled

Funding Source: Public

Point of Contact Information:

Coverage: Continental U.S.

Name: Geoff DiMego

Phone: 301-763-8000 x 7221

Email: geoff.dimego@noaa.gov

Web site: <http://www.nco.ncep.noaa.gov/pmb/products/nam/>

Description: The North American Mesoscale (NAM) Model is a regional mesoscale data assimilation and forecast model system. NAM, formerly known as the ETA model, is currently referred to as the WRF-NMM (Non-hydrostatic Mesoscale Model of the Weather Research and Forecasting System). The model is run by the National Centers for Environmental Prediction for short term weather forecasting. This model is run four times a day (00, 06, 12, 18Z), with predictions extending out to 84 hours. It has a 12 km horizontal resolution and 60 layers in the vertical direction. The NAM has non-hydrostatic dynamics, a full suite of physical parameterizations, and a land surface model.

Information on the model products is found at <http://www.nco.ncep.noaa.gov/pmb/products/nam/>

The latest information about the NAM model is: <http://www.emc.ncep.noaa.gov/modelinfo>

SAROPS Applicability: The NAM is presently being run on an operational basis and is used by SAROPS. This product rates very highly and is recommended for inclusion in the SAROPS EDS.

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Product Provider: Northwest Association of Networked Ocean Observing Systems (NANOOS)

Center / Department / Section:

Product Name: NANOOS Observing System

Parameters:	Sea-surface currents Wave direction	Salinity	Sea surface/subsurface temperature
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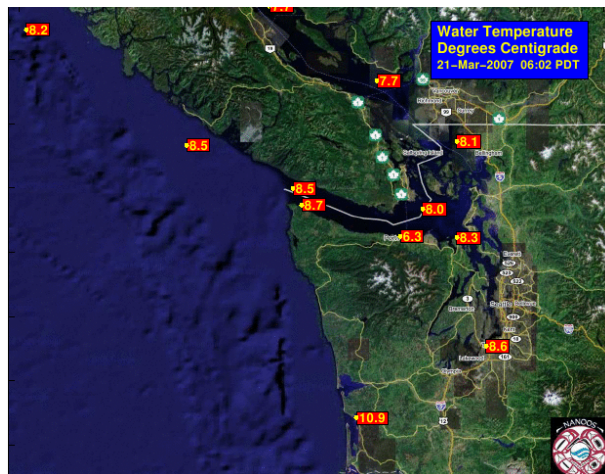
Product Type: Oceanographic Observed

Funding Source: Public

Point of Contact Information:

Coverage: Northwest coast & Puget Sound

Name: Jan Newton
Phone: 206-543-9152
Email: newton@apl.washington.edu
Web site: <http://www.nanoos.org>



Description: The NANOOS Pilot Project distributes observations for the estuaries and coast of Oregon and Washington. The project is developing nowcast and predictive capabilities for this environment, as well as interactive access to archival data, real-time data, and selected forecasts. The Web site provides two experimental products, both derived from buoy data (NOAA and others): near-surface water temperatures for Puget Sound and near-surface water temperatures for the Northwest coast.

SAROPS Applicability: The surface current data derived from the OSU CODAR system are the most significant parameter available from this RA and is available either from SIO, Rutgers, or NDBC. The OSU CODAR-derived surface currents product is recommended for use in SAROPS EDS, contingent on further examination and processing of the returns.

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Product Provider: Oceanweather Inc.

Center / Department / Section:

Product Name: Global Wind/Wave Analysis and Forecast

Parameters:	Wave direction Wave significant height	Wave max height	Wave peak period
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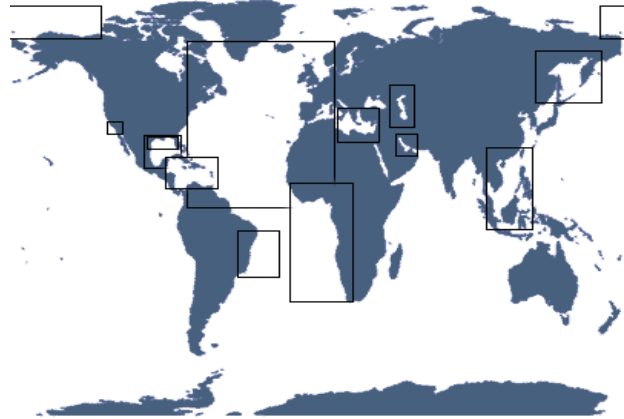
Product Type: Oceanographic Modeled

Funding Source: Private

Point of Contact Information:

Coverage: Global and Regional

Name: Brian Callahan
Phone: 203-661-3091
Email: brianc@oceanweather.com
Web site: <http://www.oceanweather.com>



Description: Oceanweather is a specialized consulting firm serving the coastal and ocean engineering communities with a unique capacity to integrate several areas of expertise into specification of definitive design data on the physical environment. Oceanweather provides solutions for marine meteorology, ocean wave and current specification, ocean engineering, and statistics of environmental data. In the past quarter century Oceanweather has performed dedicated hindcast studies and Joint Industry Projects (JIPs) in virtually every ocean basin in the world.

Since 1983, Oceanweather has operated a real time forecasting division that includes a global wind and wave forecast system and various high resolution regional applications.

Global wave models are run daily, and higher resolution models are run for specific areas dependent on the client's needs (examples include Gulf of Mexico, East Coast U.S., and South China Sea). Generally, they are running wave models for the regions, although they are considering current models in the future. They use a combination of models such as Wave Model (WAM) (which they were involved in developing) as well as other wave models that they develop in-house. They use what model works best for the region and local conditions.

The results are sent as images and raw data. The raw data are sent in compressed format and built into images by client-side software. The models are typically run 2-4 times a day, and output time steps are every three hours. The forecast can be up to 10 days.

They are not currently running atmospheric models but ingest atmospheric data from other models.

SAROPS Applicability: This is a useful source of wave forecast data for different regions. OceanWeather has a long history of meeting the needs of operational users in the oil and gas industry. The USCG would need an agreement on what domains need to be modeled, since OceanWeather sets up model domains based on user demands. Data integration for SAROPS would require considerable collaboration with OceanWeather staff. This product rated highly in all areas except for domain, applicability and resolution. Oceanweather has indicated that they are able to adapt models to better suit USCG needs if desired. This product is conditionally recommended for inclusion in the SAROPS EDS for use in areas where the need exists to fill in spatial coverage gaps.

Product Provider: Oregon Health & Science University, Center for Coastal and Land-Margin Research

Center / Department / Section: OGI School of Science and Engineering,

NSF Science and Technology Center for Coastal Margin Observation and Prediction (CMOP)

Product Name: CORIE Models

Parameters: Sea-surface currents
Sea surface/subsurface temperature

River discharge
Water level

Salinity

Product Type: Oceanographic Modeled

Funding Source: Public

Point of Contact Information:

Coverage: Columbia River & Oregon Coast

Name: Phil Barrett

Phone: 503-748-4059

Email: barrett@ebs.ogi.edu

Web site: <http://www.stccmop.org/corie>

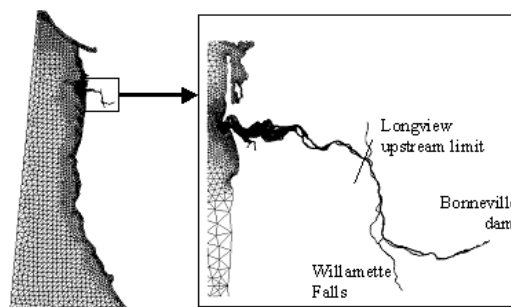


Fig. 2: CORIE domain

Description: CORIE is a modeling and observing system for the Columbia River estuary and plume. Modeling efforts address the estuary and the coastal waters between southern British Columbia and northern California. According to its Web site, the model provides ~100 m resolution in the estuary (~100 m) and near-plume (~250 m). Integral to the design is automated access to all external forcings (tides, ocean conditions, atmospheric conditions, river inputs) and to a core set of observations from CORIE and other regional in-situ networks. Data assimilation is used sparingly.

SAROPS Applicability: CORIE appears to be a potentially useful product that is not presently configured for operational use. This product should be considered if a need exists for information in this area. This product is not recommended for inclusion in the SAROPS EDS at this time.

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Product Provider: Oregon Health & Science University, Center for Coastal and Land-Margin Research

Center / Department / Section: OGI School of Science and Engineering, NSF Science and Technology Center for Coastal Margin Observation and Prediction (CMOP)

Product Name: CORIE Observations

Parameters: Sea-surface currents	Salinity
Sea surface/subsurface temperature	Water level

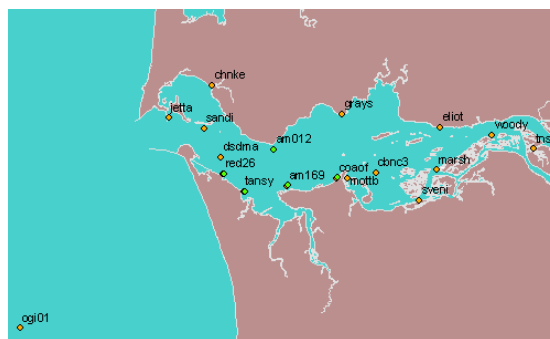
Product Type: Oceanographic Observed

Funding Source: Public

Point of Contact Information:

Coverage: Columbia River & Oregon Coast

Name: Phil Barrett
Phone: 503 748-4059
Email: barrett@ebs.ogi.edu
Web site: <http://www.stccmop.org/corie>



Description: CMOP is a Science and Technology Center funded by the National Science Foundation with assistance from its member institutions, the Oregon Health & Science University, Oregon State University, and the University of Washington. The primary areas of interest and investigation are the Columbia River and the adjacent coastal areas of the Pacific Northwest. Operated by OHSU-OGI (Oregon Graduate Institute) since 1996, CORIE is an observation and predication system for the Columbia River estuary and plume.

CORIE's observational network consists of 20 stations: 18 in the estuary and 2 off the coast, which are operated seasonally. Measurements vary with location, with temperature provided at all stations. An interactive map provides access to real-time data where available and historical data (http://www.stccmop.org/corie/observation_network). The Web site notes that real-time observations have limited quality control.

SAROPS Applicability: We found only 6 of the stations presently operating. None of the stations were measuring currents. This product would be useful as a data supplement to a model or HF radar surface current product. This product is not recommended for inclusion in SAROPS EDS at this time.

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Product Provider: Oregon State University, College of Oceanic & Atmospheric Sciences

Center / Department / Section:

Product Name: Surface Current Maps

Parameters: Sea-surface currents

Product Type: Oceanographic Observed

Funding Source: Public

Point of Contact Information:

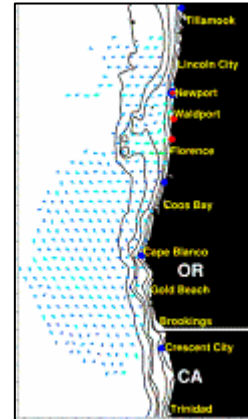
Coverage: Oregon coast

Name: Michael Kosro

Phone: 541-737-3079

Email: kosro@coas.oregonstate.edu

Web site: <http://bragg.coas.oregonstate.edu>



Description: The Ocean Currents Mapping Lab at Oregon State University broadcasts daily averages for ocean surface currents off the coast of Oregon at a medium spatial resolution. Daily averages are presented to reduce tidal variations. High-resolution HF radar maps are produced for the areas near Newport, OR, and on a seasonal basis near the Columbia River mouth. The Web site displays the most current map and the previous day; historical maps are available through links. The data are research measurements that have not been thoroughly checked; users should expect inaccuracies.

SAROPS Applicability: As the system is presently operated, data are subjected to significant smoothing before being posted. We recommend that the performance of this product be further examined through intercomparison with other data sources before it is incorporated into SAROPS. This product is conditionally recommended for inclusion in the SAROPS EDS.

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Product Provider: Rutgers University

Center / Department / Section: Institute of Marine and Coastal Sciences

Product Name: Coastal Ocean Observation Lab (COOL)

Parameters:	Sea-surface currents	Sea surface/subsurface temperature
	Wave direction	Wave max height
	Wave peak period	Wave significant height

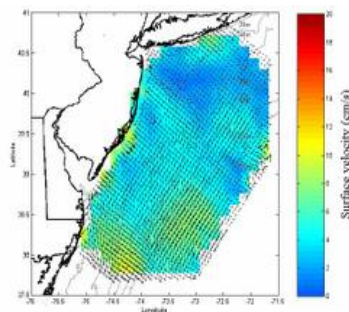
Product Type: Oceanographic Observed

Funding Source: Public

Point of Contact Information:

Coverage: New York Bight

Name: Josh Kohut
Phone: 732-932-6555 x 542
Email: kohut@marine.rutgers.edu
Web site: <http://www.thecoolroom.org>



Description: The Coastal Ocean Observation Lab (COOL) research focuses on the bio-physical processes of the coastal ocean. The COOL Operations Center maintains a suite of oceanographic sensors to collect real-time data in support of research projects, technology development, and education and outreach.

There are four primary observation platforms that the COOL Operations Center maintains:

- CODAR derived surface currents. The COOL Operations Center maintains a nested CODAR network made up of 10 sites along the coast. A long-range component provides sea-surface current maps every hour (representing a 3-hour average) that extend off the coast of New Jersey to the shelf break with a 6 km resolution. Nested within that is a short range system near the New York Harbor mouth providing surface current maps every 30 minutes (representing a 75-minute average) with a 1-km resolution. The data are available as images, but could be made available as actual current data.
- Sea Surface Temperature (SST) is derived from NOAA AVHRR data. The COOL Operations Center tracks all the NOAA (4) satellites with their ground station and satellite dish. They process the data using the Multichannel Sea Surface Temperature (MCSST) process (similar to the Non Linear Sea Surface Temperature (NLSST) process that NOAA uses). Data have been made available since 1995 on the Web site for the NY/NJ region. Since 2000, COOL has also made SST data available for the U.S. East Coast and the Gulf of Mexico. It is an automated system where data are processed as satellite passes arrive; this can happen up to eight times in a 24-hour period. The data are made available as JPEGs, which are created with Matlab from HDF, but the data could be made available in other formats. They also have experimental ocean-color data (http://www.marine.rutgers.edu/cool/sat_data).
- Autonomous Underwater Gliders – gliders provide full water column temperature and salinity data as they move out across the shelf. Typical deployments last 30 days with real-time data telemetry back to COOL. They maintain an endurance line, from Tuckerton, NJ to

the shelf break where they try to have a glider deployed at all times for near-continuous data. That data (images) are available on the Web. Data could be set up to be sent in different formats.

- An underwater node near Tuckerton, NJ provides a continuous link to the sea floor. Full water column measurements of currents, salinity and temperature are routinely logged. In addition time series of wave height and period are made available. The data are available as images on the Web. Data may be sent in different formats.

SAROPS Applicability: This laboratory provides expertise in integration of different observation data that can be useful for SAR operations. Of specific use is the integration of multiple sea-surface radar sites, which provides a broad coverage area for sea-surface currents. Data from sea surface radar can readily be integrated into SAROPS.

COOL is presently set up with a research focus that is represented in their relatively low operational status score. The remaining category scores are very high and indicate that this product is relatively valuable for SAR support in the Mid-Atlantic Bight area. This product is recommended for inclusion in the SAROPS EDS.

Product Provider: University of North Carolina Chapel Hill / SECOORA

Center / Department / Section: Marine Science

Product Name: North Carolina Coastal Ocean Observing System (NCCOOS)

Parameters:	Sea-surface currents	Salinity	Sea surface/subsurface temp
	Water level	Wave direction	Wave max height
	Wave peak period	Wave significant height	

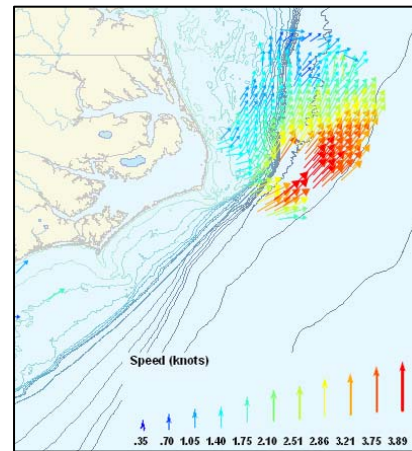
Product Type: Oceanographic Observed

Funding Source: Public

Point of Contact Information:

Coverage: North Carolina coast

Name: Jesse Cleary
Phone: 919-962-4987
Email: jcleary@email.unc.edu
Web site: <http://nccoos.org>



Description: High-frequency radars operating at two sites on the North Carolina coast provide remote measurements of sea-surface currents. Water level, wave information, and a current profile are collected at an instrumented pier and made available in near real time. An interactive map shows sea surface temperature, surface current, water level, and wind observations from regional stations.

SAROPS Applicability: The CODAR system is operated by the University of North Carolina and evaluated separately in this report. One salinity sensor (the Neuse River Profiler) appeared to have limited data for a deployment last summer. The Cape Lookout Buoy, which measures temperature, salinity, and currents, was added in July 2007.

As the description states, SEACOORA is an RA, and the site integrates data collected by its member organizations. The RAs are valuable in coordinating and planning uses, but data access should be accomplished by other means. The data on this site are available from other sources. Like many of the similar OOS systems, the system is run as a demonstration project and would require a change of mission before it is ready for SAROPS use.

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Product Provider: Southeastern Universities Research Association (SURA)

Center / Department / Section: Coastal Ocean Research

Product Name: Interoperability Demonstration Web site

Parameters:	Sea surface/subsurface temperature	Water level	Wave direction
	Wave peak period	Wave significant height	

Product Type: Oceanographic Observed

Funding Source: Non-profit

Point of Contact Information:

Coverage: North American coast

Name: Joanne Bintz
Phone: 202-408-7872
Email: bintz@sura.org
Web site: <http://www.openioos.org>



Description: SURA is a nonprofit university consortium established to foster collaboration and encourage new ideas for collaboration. The SURA Coastal Ocean Observing and Prediction (SCOOP) Program established the www.OpenIOOS.org Web site serves as a test bed for demonstrating interoperability. It displays a map of real-time sea surface temperatures for North America that provides the option of viewing sub-regions (Gulf of Maine, Southeast Atlantic, Gulf of Mexico, Caribbean, Pacific Northwest, Alaska, and the Great Lakes). Layers provide satellite imagery, information on water levels (from NOAA and UNC) and wave heights (NDBC buoys), and models of ocean currents (from UNC) and waves (from GoMOOS). An SOS Salinity link provides access to a graphic of real-time salinity measurements from a sensor observation service (SOS) that includes multiple sensors on the east and west coasts, the eastern Gulf of Mexico, and from Alaska.

A link to wave models shows observed wave heights from NDBC buoys and WW3 model results and animates the model results, including a 24-hour forecast visualization. In a similar manner a link to water level models displays water levels observations (from NOAA coastal water levels) and the ADCIRC model. A data-to-model comparison is available by clicking on select buoys on the visualizations.

SAROPS Applicability: The SURA SCOOP site integrates information provided by others, so it is not a SAROPS integration candidate. Users interested in using the data for guidance should refer to the reviews of the providers' sites.

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Product Provider: Southeastern Universities Research Association (SURA)

Center / Department / Section: Coastal Ocean Research

Product Name: Wave Watch 3

Parameters: Wave max height

Product Type: Oceanographic Modeled

Funding Source: Non-profit

Point of Contact Information:

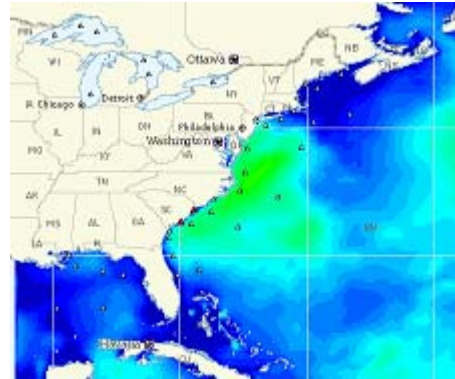
Coverage: East coast and Gulf of Mexico

Name: Joanne Bintz

Phone: 202-408-7872

Email: bintz@sura.org

Web site: <http://www.openioos.org>



Description: SURA is a consortium of over 60 American universities. One of the consortium's initiatives is the SURA Coastal Ocean Observing and Prediction (SCOOP) Program. The www.OpenIOOS.org Web site serves as a user interface for obtaining observations and model visualizations. According to the site, "OpenIOOS is a grass-roots partnership effort to support integration of the various activities involved in collection of observations and making predictions of the coastal environment, including contributions from federal agencies and research institutions."

A WW3 model application provides wave height output for the east coast and most of the Gulf of Mexico. Predictions out to 48 hours are posted daily starting at 00Z. A data-model comparison is available by clicking on select buoys on the visualizations.

SAROPS Applicability: The Web site overlays observed wave heights from NDBC buoys and WW3 model results on a map and animates the model results, including a forecast. It does the same thing for water level observations (from NOAA coastal water levels) and the ADCIRC model.

This data-set site is integrated into SCOOP for demonstration purposes and is not recommended for inclusion in the SAROPS EDS. The information is provides appears to be of good quality, so it is acceptable for reference purposes.

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Product Provider: Stevens Institute of Technology

Center / Department / Section: Center for Maritime Systems/ Davidson Laboratory

Product Name: New York Harbor Observation and Prediction System (NYHOPS)

Parameters: River discharge
Sea-surface currents
Water level

Salinity
Sea surface/subsurface temperature

Product Type: Oceanographic Modeled

Funding Source: Private

Point of Contact Information:

Coverage: NY Harbor

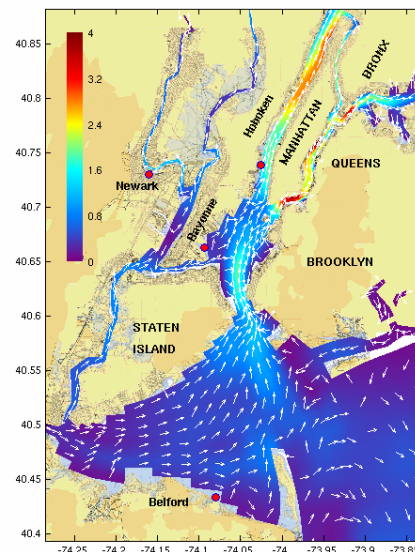
Name: Jeremy Turner

Phone: 201-216-5223

Email: jturner@stevens.edu

Web site:

<http://hudson.dl.stevens-tech.edu/NYHOPS>



Description: NYHOPS consists of a 3-D physical hydrodynamic predictive model (the Estuarine and Coastal Ocean Model version of the Princeton Ocean Model), which is constantly under development/improvement at Stevens Institute of Technology. At present, it is run once daily and offers high-resolution predictions of water parameters including current speed and direction, water elevation, water temperature, and salinity in all areas of the greater New York Harbor Complex out to the continental shelf break. Predictions have an hourly time step out to 48 hours. The model is run operationally once a day with a flexible grid system that has grid resolution down to 50 m in some places. The output is in NetCDF format and can be made available upon request. The output of the model is 3-D currents with 10 layers, temperature, salinity, and water level.

The model makes use of data for boundary conditions and data assimilation from various sources, including the New York Harbor Observing System (NYHOS) sensors maintained by Stevens, the United States Geological Survey (USGS), NOAA, NWS PORTS, NDBC, and the New York City Department of Environmental Protection. Comparisons of the model predictions and observations are performed on an on-going basis. Their users include local authorities, law enforcement and fishermen. This is an independent effort to the NOS model for the same region.

The Stevens Institute of Technology is also planning on adding wave modeling in the near future.

SAROPS Applicability: This product is presently not operational; however, the responder indicated that plans exist to go operational in 12-24 months. Domain applicability and resolution of this product are very good. This product is a useful information source for the New York harbor area.

This product is recommended for inclusion in the SAROPS EDS.

Product Provider: Stevens Institute of Technology

Center / Department / Section: Center for Maritime Systems/ Davidson Laboratory

Product Name: New York Harbor Observing System (NYHOS)

Parameters:	Sea-surface currents	Salinity	Surface/subsurface temp
	Turbidity	Water level	Wave direction
	Wave max height	Wave peak period	Wave significant height

Product Type: Oceanographic Observed

Funding Source: Private

Point of Contact Information:

Coverage: New York Harbor

Name: Jeremy Turner

Phone: 201-216-5223

Email: jturner@stevens.edu

Web site: <http://www.stevens.edu>



Description: NYHOS consists of a broad range of real time in-water instrumentation. Data from this system are then provided to the public via Web interface after a QA/QC process. The observing system consists of stations maintained by the Stevens Institute of Technology for atmospheric conditions, water level, currents, temperature and salinity at approximately nine stations. They also have five stations on the NJ coast; these stations also provide wave height at the beach just outside the surf zone. The data are collected in near real-time, in most cases less than 15 minutes from observation time. As soon as they are received, they are made available, and a QA/QC process is run on the fly. The observing system is also a clearinghouse for data from NOAA PORTS, NWS and the Brookhaven Laboratory.

The Stevens Institute of Technology also maintains a CODAR system for Raritan Bay that resolves currents in the main shipping channel. This is a high-frequency system, 45 MHZ, which provides better than a 1-km resolution with less than an hour time step.

The Stevens Institute of Technology also partners with the Rutgers University CODAR systems at Rockaway and Sandy Hook. Radial data from the CODAR systems are combined to produce

vector maps for the region. This data set is not yet available on-line, but plans are in place to make it available.

SAROPS Applicability: This product rated very highly in all areas and represents a valuable information source for the New York Harbor area. The data are not currently available, but data from sea surface radar can readily be integrated into SAROPS. This product is recommended for inclusion in the SAROPS EDS.

Product Provider: surfline.com

Center / Department / Section:

Product Name: models and buoy observations

Parameters:	Sea-surface currents	Salinity	Sea surface/subsurface temp
	Wave direction	Wave max height	Wave peak period
	Wave significant height		

Product Type: Oceanographic Modeled

Funding Source: Private

Point of Contact Information:

Coverage: Global

Name: Dan Martin

Phone:

Email: dan_martin@buoyweather.com

Web site: <http://www.buoyweather.com>
<http://www.surfline.com>

Description: Surfline.com is a commercial Web site that is primarily intended for surfers. The service includes live webcams, nearshore waves and winds, surf reports and forecasts. Forecasts of surf height, offshore swell height, and swell period are derived from a global surface wave model (LOLA) Surfline says that LOLA is a proprietary wave propagation model that uses offshore boundary data and local bathymetry to propagate waves into the shore. LOLA is run simultaneously for multiple global, medium resolution, and nearshore cases. LOLA predictions are calculated by super-positioning wave height and direction combinations at the seaward boundary. The nearshore runs are made for the U.S. East Coast (from Florida to Maine, with a gap in the Georgia – South Carolina area that is presently being filled) and west coasts (from Baja Mexico to the mouth of the Columbia River) out to 20-30 miles at a 100-m spatial resolution.

Surfline is operated by staff meteorologists on a 24 x 365 basis. Analyses and forecasts are adjusted using satellite and offshore buoy data. The Surfline site also reports surface current, surface temperature and salinity data obtained from other (e.g. NOAA) sources.

Buoyweather.com is an associated product line that provides a “Supercharts” product, described as “a dynamic charting tool based on GRADS software and data from NOAA’s WAVEWATCH 3 wave models, NOAA’s Global Forecast System (GFS) and North American Mesoscale (NAM) Models.” Chart types include significant wave height, wave period, and sea surface temperature. The Web site also displays data from other. Also available on the Web site are ‘virtual buoys’ that appear to provide a model output for wave height (average and maximum), wave period, and direction that is interpolated to the locations of the virtual buoys.

Buoyweather wave forecast products are currently based on the global (NWW3) 1.25° X 1.0° between latitudes 78° north to 78° south, the regional Western North Atlantic .25° X .25°, the regional Eastern North Pacific .25° X .25°. The models provide data for ocean regions only. The NOAA Global Forecast System (GFS) provides global data on a 1°x1° degree grid that covers the world including land points.

SAROPS Applicability: Surfline and Buoyweather provide very detailed resolution predictions along the Atlantic and Pacific coasts.

The Buoyweather/Surfline wave model products are considered operational due to their paying client base. Surfline and Buoyweather staff was responsive to inquiries. Salinity, temperature, and SST data are obtained by Surfline from other sources. The Surfline wave model products are recommended for inclusion in the SAROPS EDS and USCG operational use, however, for the other parameters, the products from other sources will meet USCG needs.

Product Provider: Texas A&M University

Center / Department / Section: Oceanography Department

Product Name: Gulf of Mexico Coastal Ocean Observing System (GCOOS)

Parameters: Air temperature Surface wind speed/gusts

Product Type: Atmospheric Observed

Funding Source: Public

Point of Contact Information:

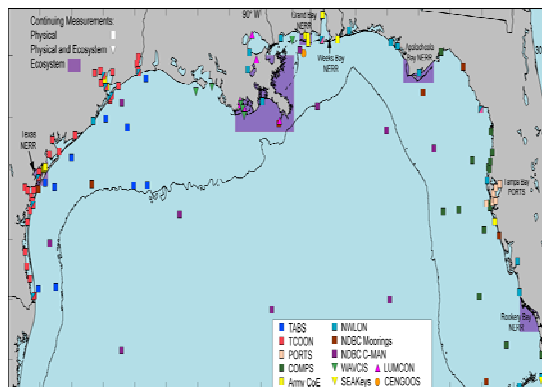
Coverage: Gulf of Mexico

Name: Worth Nowlin

Phone: 979-845-3900

Email: wnowlin@tamu.edu

Web site: <http://www.gcoos.org>



Description: Many organizations and individuals are concerned with sustained observations and/or products and services based on such observations from the estuaries and Exclusive Economic Zone of the Gulf of Mexico. A group of these entities have signed a resolution agreeing to form a Gulf of Mexico Coastal Ocean Observing System (GCOOS) beginning with the integration of existing observing system elements and the sharing of non-commercial and non-proprietary data and products. This regional system will be a part of the U.S. sustained and Integrated Ocean Observing System (IOOS).

GCOOS plays a significant role in coordination of different groups that perform observing and modeling programs in the Gulf of Mexico. They have successfully coordinated efforts for measurement data from oil companies, state agencies, and federal agencies to be centralized at NDBC.

GCOOS is working with institutions to coordinate efforts on management and distribution of historical data, including setting up OPeNDAP servers for data access. They also host workshops with different user groups to identify user needs for issues such as algal bloom, human health, and issues related to oil and gas activities.

The score shown above does not reflect the individual products provided by any of the GCOOS partners. A future survey would be well served by receiving questionnaires from each of the data providers in the GCOOS framework.

SAROPS Applicability: GCOOS serves as a coordinating body for modeling and observing efforts in the Gulf of Mexico. The relatively low scores do not reflect on these modeling/observing activities, but instead indicate that the operational and QA/QC functions are handled by others. This product is not recommended for inclusion in the SAROPS EDS at this time.

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Product Provider: Texas A&M University

Center / Department / Section: Oceanography Department

Product Name: TABS Model

Parameters: Sea-surface currents

Product Type: Oceanographic Modeled

Funding Source: Public

Point of Contact Information:

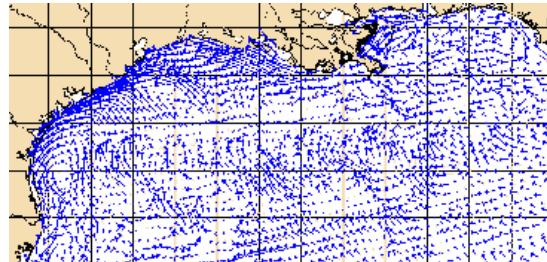
Coverage: Gulf of Mexico

Name: Robert Hetland

Phone: 979-458-0096

Email: hetland@tamu.edu

Web site: <http://seawater.tamu.edu/tglo/>



Description The Texas General Land Office Coastal Current Forecast page contains “forecast surface currents POM model” (hourly from yesterday at 1900 to tomorrow at midnight). It consists of near-surface currents derived from a numerical model driven by NCEP forecast wind fields. The page also displays forecast winds every three hrs from yesterday at 1900 to today + 2 at 0400 (NCEP Eta-12 winds at 10m above ground level). The page contains a link to “forecast surface currents ROMS current model.” It also has near-surface currents derived from a numerical model driven by NCEP forecast wind fields.

SAROPS Applicability: The TABS system appears to be relatively stable and comprehensive. Its mission of providing information for oil spill response is consistent with the USCG’s SAR data needs. This system is recommended for inclusion in the SAROPS EDS.

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Product Provider: Texas A&M University-Corpus Christi

Center / Department / Section: Conrad Blucher Institute

Product Name: Texas Coastal Ocean Observation Network (TCOON)

Parameters: Salinity Sea-surface currents Sea surface temperature Water level

Product Type: Oceanographic Observed

Funding Source: Public

Point of Contact Information:

Coverage: Texas

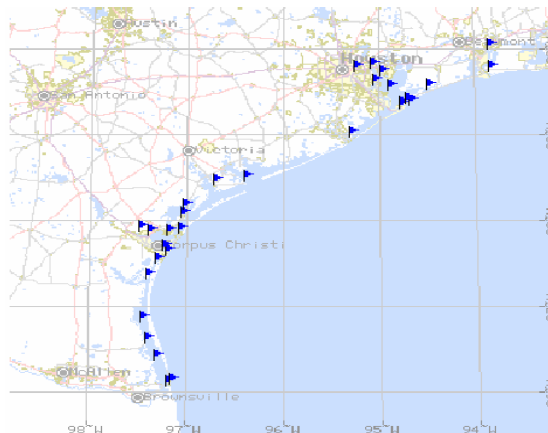
Name: Gary Jeffress

Phone: 361-825-2720

Email: jeffress@falcon.tamucc.edu

Web site:

<http://lighthouse.tamucc.edu/TCOON/HomePage>



Description: In 1989, the Conrad Blucher Institute (CBI) for Surveying and Science at Texas A&M University-Corpus Christi commenced the installation of a modern state-of-the-art water-level measurement system along the Texas coast. The first measurement systems installed by CBI were intended to provide real-time water-level and meteorological information to the City of Corpus Christi to assist local officials with preparations for incoming hurricanes and tropical storms. From this initial work, other state agencies such as the Texas General Land Office and the Texas Water Development Board began contracting CBI to provide similar information for other areas along the Texas coast. Following a Texas Legislative mandate in 1991, this network of water level gauges became the Texas Coastal Ocean Observation Network (TCOON). As a result, TCOON expanded from an initial three stations in Corpus Christi in 1989 to over forty stations by 1992.

TCOON maintains its own communications system (packet radio network), and also uses cell-phone, GOES, and direct Internet connection via satellite. In fact, they are planning to have each station on the Internet with its own Internet Protocol address. The 2-year goal is to have all station data collected and available within six minutes of collection.

TCOON has a sophisticated data management system that collects and centralizes data in a MySQL database. The data are normalized into standard quality-controlled interchange formats for easy access. A variety of data extraction routines are available so users can access the data in a variety of formats. All data collected since 1991 are available on-line. They also provide their data to NOAA CO-OPS where it is available through the Tides Online program. TCOON also maintains the PORTS system for Galveston Bay.

Most of TCOON's information goes to NOAA. Another client is the Port of Corpus Christi, which is funding operation of at least four current meters. Three (Ingleside, JFK bridge, and Port Aransas) are in navigation channels leaving the Port. The fourth is a short distance offshore. These data apparently do not go to NOAA, and the USCG should get this information. Depth of measurements is not known.

TCOON also maintains a network of near real-time water quality observation sites that collect data for a variety of parameters including salinity, PH, and dissolved oxygen. They play a large role in GCOOS and are a key provider of in-situ observation data.

The user base is relatively broad (including fishermen, surfers, sailors, and scientists), and the site gets about 750 hits daily.

TCOON has a solid funding history with funding from the Texas General Land Office, the Texas water development board, NOAA-NOS, the Corps of Engineers, and the city of Corpus Christi.

SAROPS Applicability: This network of sensors and sophisticated data management infrastructure make this a valuable source of observation data for the Texas coast. The system maintains current meters at three inshore locations that are not otherwise available. These include two stations in navigable channels. They have experience meeting the needs of operational users and redundant communications paths to ensure robust data returns. This system scored well in all areas. This product is recommended for inclusion in the SAROPS EDS.

Product Provider: Texas General Land Office (TGLO)

Center / Department / Section: Oil Spill Prevention & Response

Product Name: Texas Automated Buoy System (TABS)

Parameters: Salinity
Sea surface/subsurface temperature

Sea-surface currents

Product Type: Oceanographic Observed

Point of Contact Information:

Name: Buzz Martin

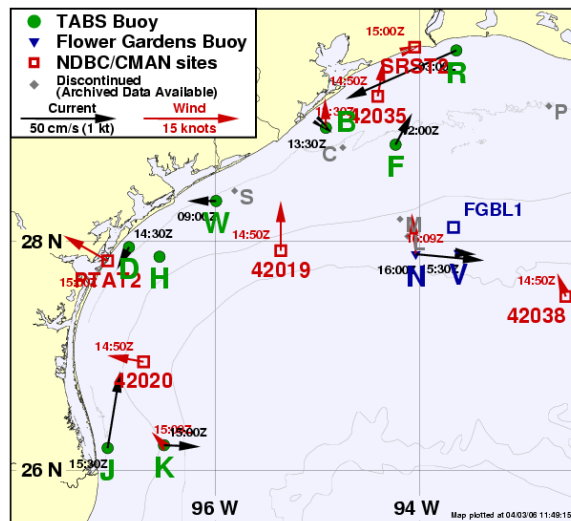
Phone: 512-475-4611

Email: buzz.martin@glo.state.tx.us

Web site: <http://tabs.gerg.tamu.edu/Tglo/>

Funding Source: Public

Coverage: Texas Coast



Description: The Texas Automated Buoy System (TABS) is a network of 10 telemetered buoys that measure near surface currents (1.5 – 2 m below surface) and winds (top of buoy so variable, but typically at 3.5 m) off the Texas coast. They have over 11 years of operational history.

Near-Real time TABS data can be viewed on-line at <http://tabs-os.gerg.tamu.edu/Tglo/>. The data are received once every three hours, although data are measured more frequently. The system can be configured to obtain data every hour. Once received, the data are made available immediately on the Web site. The QA/QC process is not performed on this published data, but is performed on the data before it is archived. The Texas General Land Office has all 11 years of archive data available on-line.

The Web site contains maps and graphics of the data. The actual raw data are also available in tabular format. The wind data are also sent to NDBC for redistribution.

They perform sophisticated on-going analysis on the data that is available through the Real Time Analysis (RTA) section of the TABS Web site.

The primary focus of the TABS program is oil spill response, as this is the funding mechanism. The state receives a 1.3 ¢ tax on every barrel of oil shipped through Texas ports and this fund is used for oil spill response and preparedness. TABS receives funding from this fund. However, they also see a wide variety of non-oil and gas users access the data. TABS also runs two ocean forecast models for the region (<http://seawater.tamu.edu/tglo/>).

SAROPS Applicability: The TABS program has a long history of meeting the needs of operational users in the oil and gas industry and oil spill response community. The data would be useful and easily integrated into SAROPS. In addition to the observation network, they have two new modeling products that could also be considered as a source of forecast current data for the Gulf of Mexico. This product rated very well in all categories and is recommended for inclusion in the SAROPS EDS.

Product Provider: United States Air Force, Air Force Weather Agency (AFWA)

Center / Department / Section:

Product Name: Weather Research and Forecast (WRF) Model

Parameters:	Atmospheric pressure	Cloud layers	Ceiling
	Total cloud cover	Icing potential	Icing layer
	Precipitation type/rate	Relative humidity	Air temperature
	Dew point	Wind chill	Visibility
	Surface wind speed/gusts	Wind turbulent kinetic energy	Winds at altitude

Product Type: Atmospheric Modeled

Funding Source: Public

Point of Contact Information:

Coverage:

Name: Evan Kuchera

Phone: 402-294-7265

Email: evan.kuchera@afwa.af.mil

Web site: <https://weather.afwa.af.mil/>

Description: Please contact our operational requirements POC, Mr. Ken Smith, at smithk@afwa.af.mil, or 1-402-294-1631, for any operational requirements you have. Our Web site is <https://weather.afwa.af.mil/>.

SAROPS Applicability: The AFWA WRF product is presently run only for the southwest Asia area. This product is not needed for SAROPS.

AFWA also runs the MM5 model globally and for selected areas such as the U.S. on 45 and 15-km grids.

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Product Provider: United States Geological Survey (USGS)

Center / Department / Section: Water Resources

Product Name: National Water Information System (NWIS) Surface-Water Data

Parameters:	River discharge	Salinity	Sea surface/subsurface Temperature
	Turbidity	Water level	

Product Type: Oceanographic Observed

Funding Source: Public

Point of Contact Information:

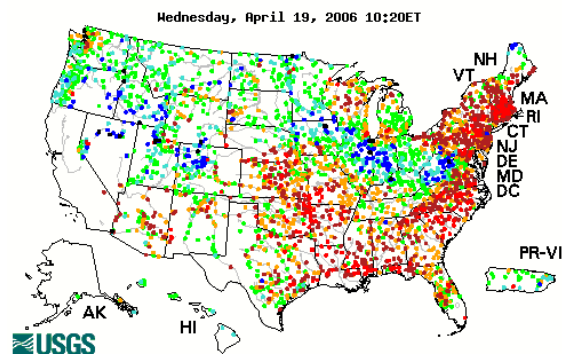
Coverage: National

Name: Stephen Blanchard

Phone: 703-648-5629

Email: sfblanch@usgs.gov

Web site: <http://waterdata.usgs.gov/nwis/sw>



Description: The USGS runs a network of about 7400 stream gages nationwide that provide data on stream flow (quantity of water) and height of the water. Data are collected every 15 minutes and transmitted at least every 4 hours. This network also includes locations where USGS operates tidal stations that record height of the water and other parameters such as salinity, wind speed and direction, and water and air temperature. All of these data are available free and online through the USGS Web pages. Historical data are also archived and available online.

Data are collected by field personnel or relayed through telephones or satellites to offices where it is stored and processed. The data relayed through the Geostationary Operational Environmental Satellite (GOES) system are processed automatically in near real time, and in many cases, real-time data are available online within minutes.

Once a complete day of readings are received from a site, daily summary data are generated and stored in the data base. Recent provisional daily data are updated on the Web once a day when the computation is completed. Annually, the USGS finalizes and publishes the daily data in a series of water-data reports. Daily stream flow data and peak data are updated annually following publication of the reports.

SAROPS Applicability: Although stream flow data are not used in most SAR areas where the USCG has responsibility, the network also collects other parameters such as wind speed and temperature in some coastal areas. The USGS has a long history of collecting and distributing data that are readily available. The low Data Quality score reflects that USGS data are “provisional” values in real-time. Given USGS’s experience and focus on quality, this score is considered to be conservatively low. This product is conditionally recommended for inclusion in the SAROPS EDS for use in areas adjacent to large rivers where river discharge information would be a significant contributor to surface currents.

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Product Provider: United States Navy, Fleet Numerical Meteorology and Oceanography Center (FNMOC)

Center / Department / Section: Department of Defense (DoD) / U.S. Navy

Product Name: Coupled Ocean Atmosphere Prediction System (COAMPS) / Centralized Atmospheric Analysis and Prediction System (CAAPS)

Parameters:	Air temperature	Atmospheric pressure	Ceiling
	Cloud layers	Dew point	Precipitation type/rate
	Relative humidity	Surface wind speed/gusts	Total cloud cover
	Visibility	Winds at altitude	Wind stress
	Wind turbulent kinetic energy		

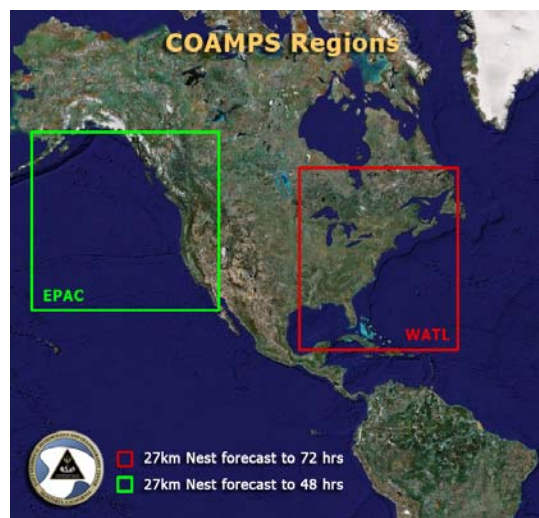
Product Type: Atmospheric Modeled

Funding Source: Public

Point of Contact Information:

Coverage: West Atlantic and East Pacific

Name: Command Duty Officer
Phone: 831-656-4325
Email: cdo@fnmoc.navy.mil
Website: <https://www.fnmoc.navy.mil/PUBLIC>



Description: The Fleet Numerical Meteorology and Oceanography Center is commonly referred to as "Fleet Numerical" or "FNMOC" and is the Department of Defense's (DoD) primary central production site for worldwide computer-generated operational meteorological and oceanographic analysis and forecast products.

FNMOC runs operational meteorological and oceanographic forecast models and also collects and manages global ship observation data. COAMPS (Coupled Ocean Atmosphere Mesoscale Prediction System) is a mesoscale meteorological model. Public data are available for the West Atlantic and East Pacific.

The fixed COAMPS models are typically run with 27-km or 18-km resolution and they run twice daily, forecasting out to 48 or 72 hours. The output time step is 1 hour. The results are available as animated charts on FNMOC's homepage, or in WMO GRIB format, or via the Navy's Metcast client/server technology to be viewed using Joint Metoc Viewer (JMV).

COAMPS predictions are driven by boundary conditions provided from the NOGAPS global model. The atmospheric/met parameters cover from 1013 mb up to 10 mb in total height, and output includes 10-m winds. More information on upper level layers is available if needed.

COAMPS performs data assimilation by use of latest model data combined with newly ingested observations. The assimilation leads to adjustment of the first-guess fields for the next run. Also, the NOGAPS boundary conditions are continuously improved upon by a similar data-assimilation process.

CAAPS (Centralized Atmospheric Analysis and Prediction System) is a customized implementation of the COAMPS model for user-specified areas of coverage and product output. CAAPS uses COAMPS physics but a user can specify the region, and resolution. Typically there is a 54-km resolution outer box, with 18-km and 6-km inner nests. An area can be requested by contacting FNMOC's 24/7 watch. CAAPS model areas run twice per day. Support is typically set up for a few weeks/months for specific exercises or events and then deactivated. Typical turn-around time from ordering a region to getting forecast results is about 24 hours. Once set up, the results will be automatically delivered until the event or exercise is complete. An example of this implementation was for post Hurricane Katrina relief operations, where high-resolution CAAPS data were made available for the coastal areas. CAAPS can provide meteograms (quick-look, visual display of forecast data for a particular lat/long point), for any desired locations within the box. The output time step is 1 hour. The results are available as animated charts on FNMOC's homepage, or in WMO GRIB format, or via the Navy's metcast client/server technology to be viewed using Joint Metoc Viewer (JMV).

SAROPS Applicability: Regional mesoscale models are very useful for assistance in SAR operations. Fleet Numerical provide these forecasts with extensive operational support and a long history of supporting operational users. They have the ability to very quickly set up new model domains for different regions of the world. This product is very well suited for USCG missions. Its main weakness is in its low resolution of the nearshore region. The data are available in a format that could be integrated into SAROPS. This site is recommended for inclusion in the SAROPS EDS.

Product Provider: United States Navy, Fleet Numerical Meteorology and Oceanography Center (FNMOC)

Center / Department / Section: Department of Defense (DoD) / U.S. Navy

Product Name: Navy Operational Global Atmospheric Prediction System (NOGAPS)

Parameters:	Air temperature	Air temperature daily max/min	
	Atmospheric pressure	Cloud layers	Dew point
	Icing layer	Precipitation type/rate	Relative humidity
	Surface wind speed/gusts	Total cloud cover	Visibility
	Winds at altitude	Wind stress	

Product Type: Atmospheric Modeled

Funding Source: Public

Point of Contact Information:

Coverage: West Atlantic and East Pacific

Name: Command Duty Officer

Phone: 831-656-4325

Email: cdo@fnmoc.navy.mil

Web site: <https://www.fnmoc.navy.mil/PUBLIC>



Description: The Fleet Numerical Meteorology and Oceanography Center is commonly referred to as "Fleet Numerical" or "FNMOC" and is the Department of Defense's (DoD) primary central production site for worldwide computer-generated operational meteorological and oceanographic analysis and forecast products.

FNMOC runs operational meteorological and oceanographic forecast models and also collects and manages global ship observation data. Public data are available for the West Atlantic and East Pacific.

NOGAPS (Navy Operational Global Atmospheric Prediction System) is a global meteorological model where surface to 4 mb is modeled. The vertical grid is described by 30-sigma levels with approximately 6-sigma levels below 850 mb, depending on terrain elevation.

NOGAPS uses a sophisticated data assimilation process to incorporate previous model run data and current observational data to provide an updated Nowcast/Analysis (or Tau 0) for the globe. The observations used for this assimilation are a combination of in-situ point-observations, satellite-derived data, ship observations, and upper-air observations.

Full NOGAPS runs are performed four times a day (00Z, 06Z, 12Z, and 18Z), with forecasts out to 144 hours. The grid resolution is 81 km, available at a 1-hour time step. The results are available as animated charts on FNMOC's homepage, in WMO GRIB format, or via the Navy's metcast client/server technology to be viewed using Joint Metoc Viewer (JMV).

SAROPS Applicability: Meteorological models are essential for assistance in SAR operations. Fleet Numerical provide these forecasts with extensive operational support and a long history of supporting operational users. Fleet Numerical also collect a huge array of observation data from Navy assets that could be integrated into SAROPS. SAROPS 1.0 currently uses Global NOGAPS. This product rated among the highest of those evaluated. Its main weakness is in the horizontal resolution in both inshore and offshore regions. This site is recommended for inclusion in the SAROPS EDS.

Product Provider: United States Navy, Fleet Numerical Meteorology and Oceanography Center (FNMOC)

Center / Department / Section: Department of Defense (DoD) / U.S. Navy

Product Name: Wave Watch 3 - Global

Parameters:	Wave direction	Wave max height	Wave peak period
	Wave significant height	White cap probability	

Product Type: Oceanographic Modeled

Funding Source: Public

Point of Contact Information:

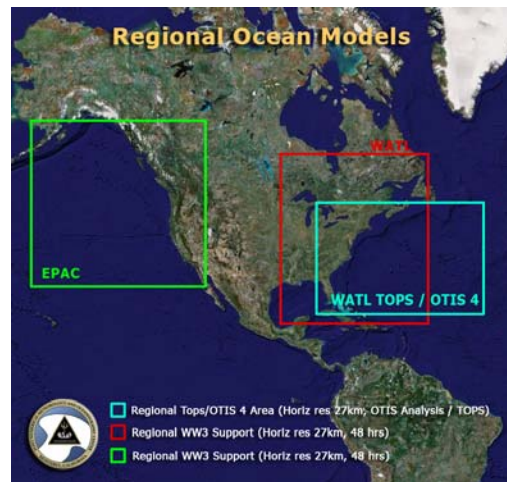
Coverage: West Atlantic and East Pacific

Name: Command Duty Officer

Phone: 831-656-4325

Email: cdo@fnmoc.navy.mil

Web site: <https://www.fnmoc.navy.mil/PUBLIC>



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FNMOC runs operational meteorological and oceanographic forecast models and also collects and manages global ship observation data. Public data are available for the West Atlantic and East Pacific.

WaveWatch III: A third generation wave model developed at NOAA. Wave Watch III solves the spectral action density balance equation for wave number-direction spectra. The implicit assumption of these equations is that the medium (depth and current) as well as the wave field vary on time and space scales that are much larger than the corresponding scales of a single wave. Furthermore, the physics included in the model do not cover conditions where the waves are severely depth-limited. This implies that the model can generally be applied on spatial scales (grid increments) larger than 1 to 10 km, and outside the surf zone.

Wave Watch III global is driven by the NOGAPS wind fields, which are used to calculate associated sea heights. It is run operationally for the globe twice a day, typically on the same time step as the NOGAPS run cycle and uses a grid resolution (81km) and time step (3 hours) similar to NOGAPS.

The results are available as animated charts on FNMOC's homepage, or in WMO GRIB format, or via the Navy's metcast client/server technology to be viewed using Joint Metoc Viewer (JMV).

SAROPS Applicability: Wave forecast data are very useful for USCG missions and Fleet Numerical have extensive experience in providing this regional and global data to operational users. The product rated well. Its main weaknesses are in its coarse spatial resolution and lower applicability for shallow or inshore waters. The data are available in a format that could be integrated into SAROPS. This site is recommended for inclusion in the SAROPS EDS.

Product Provider: Fleet Numerical Meteorology and Oceanography Center (FNMOC)

Center / Department / Section: Department of Defense (DoD) / U.S. Navy

Product Name: Wave Watch 3 (WW3) - Regional

Parameters: Wave direction	Wave max height	Wave peak period
Wave significant height	White cap probability	

Product Type: Oceanographic Modeled

Funding Source: Public

Point of Contact Information:

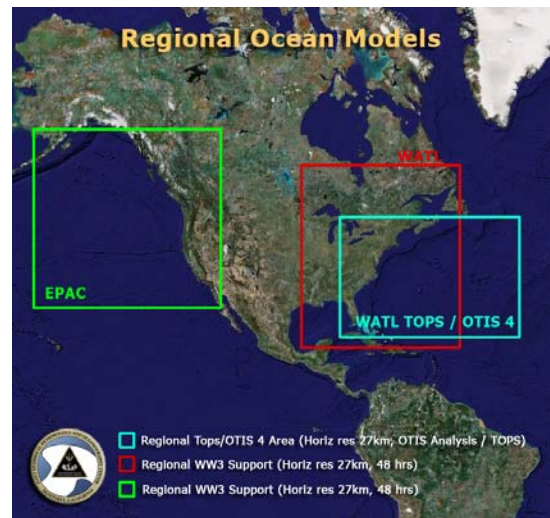
Coverage: West Atlantic and East Pacific

Name: Command Duty Officer

Phone: 831-656-4325

Email: cdo@fnmoc.navy.mil

Web site: <http://www.fnmoc.navy.mil/PUBLIC>



Description: The Fleet Numerical Meteorology and Oceanography Center is commonly referred to as “Fleet Numerical” or “FNMOC” and is the Department of Defense’s (DoD) primary central production site for worldwide computer-generated operational meteorological and oceanographic analysis and forecast products.

FNMOC runs operational meteorological and oceanographic forecast models and also collects and manages global ship observation data. Public data are available for the West Atlantic and East Pacific.

WaveWatch III: A third generation wave model developed at NOAA that solves the spectral action density balance equation for wave number-direction spectra. The implicit assumption of these equations is that the medium (depth and current) as well as the wave field vary on time and space scales that are much larger than the corresponding scales of a single wave. The physics included in the model do not cover conditions where the waves are severely depth-limited. This implies that the model can generally be applied on spatial scales (grid increments) larger than 1 to 10 km, and outside the surf zone.

Wave Watch III is also run for fixed mesoscale areas. The regional WaveWatch III predictions are driven by the COAMPS wind fields and have a grid resolution of 27-km or 18-km, per the associated COAMPS area.

The results are available as animated charts on FNMOC's homepage, or in WMO GRIB format, or via the Navy's metcast client/server technology to be viewed using Joint Metoc Viewer (JMV).

SAROPS Applicability: Wave forecast data are very useful for USCG missions, and FNMOC has extensive experience in providing this regional and global data to operational users. The product rated well. Its main weaknesses are its coarse spatial resolution and lower applicability to shallow and inshore areas. The data are available in a format that could be integrated into SAROPS. This site is recommended for inclusion in the SAROPS EDS.

Product Provider: U.S. Navy, Fleet Numerical Meteorology and Oceanography Center (FNMOC)

Center / Department / Section:

Product Name: Navy Coupled Ocean Data Assimilation (NCODA) - Atmospheric

Parameters:	Atmospheric pressure	Cloud layers	Ceiling
	Total cloud cover	ERI	Icing potential
	Icing layer	Precipitation type/rate	Relative humidity
	Air temperature	Dew point	Visibility
	Surface wind speed/gusts	Wind stress	
	Wind turbulent kinetic energy	Winds at altitude	

Product Type: Atmospheric Modeled

Funding Source: Public

Point of Contact Information:

Coverage:

Name: Ranjit Passi

Phone: 831-656-4572

Email: Ranjit.passi@navy.mil,
Andrew.Hergert@navy.mil

Web site: <https://www.fnmoc.navy.mil/PUBLIC/NCODA/ncoda.html>

Description: FNMOC performs ocean analyses of temperature, salinity and sea ice using the Navy coupled Ocean Data Assimilation (NCODA) system, which is based on multivariate Optimum Interpolation (OI) technique, for various oceanic regions needed for Navy (and its customers including USAF, USCG) operational needs. These analyses are used as input to the FNMOC Thermal Ocean Prediction System (TOPS) model to derive currents, which are provided to USCG for their SAR application.

SAROPS Applicability: NCODA is an analysis product, so it does not provide a forecast. Its use for SAR would therefore be similar to that for HF radar data, for simulating recent conditions. The POC responded that NCODA is used by FNMOC to run the TOPS (Thermal Ocean Prediction System) model, which is a wind-driven ocean model, based on very simple physics that provides forecasts of temperature and currents.

This product would be useful as a supplemental source, or for information purposes for offshore waters. For surface currents, the global and relocatable NCOM (Navy Coastal Ocean Model), operationally run at the Naval Oceanographic Office (NAVO), is the favored Navy source. This product is conditionally recommended for inclusion in the SAROPS EDS.

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Product Provider: U.S. Navy, Fleet Numerical Meteorology and Oceanography

Center / Department / Section:

Product Name: Navy Coupled Ocean Data Assimilation (NCODA) - Oceanographic

Parameters:	Sea-surface currents	Ice cover	Salinity
	Sea surface/subsurface temperature	Wave direction	Wave max height
	Wave peak period	Wave significant height	

Product Type: Oceanographic Modeled

Funding Source: Public

Point of Contact Information:

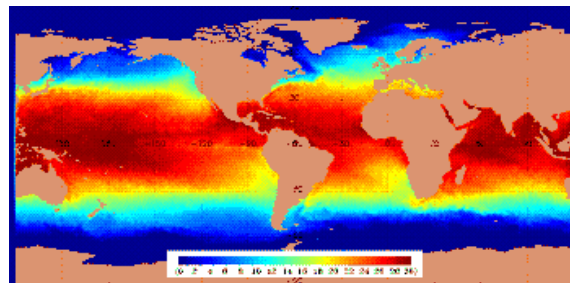
Coverage: Global

Name: Ranjit Passi

Phone: 831-656-4572

Email: Ranjit.passi@navy.mil,
Andrew.Hergert@navy.mil

Web site: <https://www.fnmoc.navy.mil/PUBLIC/NCODA/ncoda.html>



Description: FNMOC performs ocean analyses of temperature, salinity and sea ice using the Navy coupled Ocean Data Assimilation (NCODA) system, which is based on multivariate Optimum Interpolation (OI) technique, for various oceanic regions needed for Navy (and its customers including USAF, USCG) operational needs. These analyses are used as input to the FNMOC Thermal Ocean Prediction System (TOPS) model to derive currents, which are provided to USCG for their SAR application. The wave products in the list above are based on the WW3 model

SAROPS Applicability: NCODA is an analysis product, so it does not provide a forecast. Its use for SAR would therefore be similar to that for HF radar data, for simulating recent conditions. The POC responded that NCODA is used by FNMOC to run the TOPS (Thermal Ocean Prediction System) model, which is a wind-driven ocean model, based on very simple physics that provides forecasts of temperature and currents.

This product would be useful as a supplemental source, or for information purposes for offshore waters. For surface currents, the global and relocatable NCOM (Navy Coastal Ocean Model), operationally run at the Naval Oceanographic Office (NAVO), is the favored Navy source. This product is conditionally recommended for inclusion in the SAROPS EDS.

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Product Provider: United States Navy, Naval Oceanographic Office (NAVOCEANO)

Center / Department / Section: NAVOCEANO/Oceanography/Ocean Models

Product Name: Global Navy Coastal Ocean Model (Global NCOM)

Parameters: Salinity	Sea-surface currents
Sea surface/subsurface temperature	

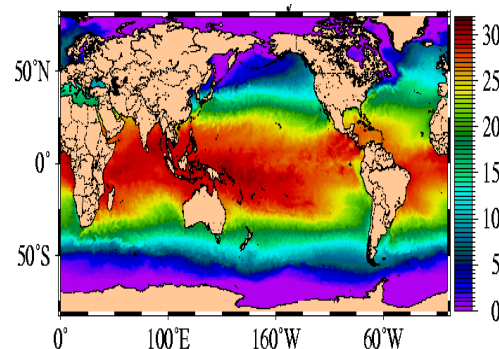
Product Type: Oceanographic Modeled

Funding Source: Public

Point of Contact Information:

Coverage: Global Coverage

Name: Frank Bub
Phone: 228-688-4758
Email: frank.bub@navo.navy.mil
Web site: <https://www.navo.navy.mil/ops.htm>



Description: The Naval Oceanographic Office (NAVOCEANO, Department of Defense), located at John C. Stennis Space Center in south Mississippi, acquires and analyzes global ocean and littoral data to provide specialized, operationally significant products and services for warfighters and civilian, national and international customers, and provides global ocean forecasting by means of the Global Navy Coastal Ocean Model (G-NCOM).

A 1/8° version of the Global NCOM is run daily at NAVOCEANO. The version incorporates atmospheric forcing from the Navy Operational Global Atmospheric Prediction System (NOGAPS) and assimilation of SST and synthetic temperature and salinity profiles via the Modular Ocean Data Assimilation System (MODAS). This climatology is based on input from the operational 1/16° NRL Layered Ocean Model (NLOM) SSH and 1/8° MODAS 2D SST Nowcasts.

The data are available in NetCDF format, COARDS and CF compliant, with a 3-hour time step and a 72-hour forecast. A 24-hour hindcast/nowcast product is also made available. The data are currently made available to the USCG by special arrangement with NAVO and the data are downloaded from NOAA's National Coastal Data Development Center (NCDDC) (<http://www.ncddc.noaa.gov/>). Others may have access to the G-NCOM data by contacting the NAVOCEANO POC.

NRL and NAVOCEANO are participants in the multi-national Global Ocean Data Assimilation Experiment (GODAE), including presence on the U. S. and international steering teams. GODAE is aimed at demonstrating real-time global ocean products in a way that will promote wide utility and availability for maximum benefit to the community.

SAROPS Applicability: NAVOCEANO provides high-resolution global data in an operational framework with a very strong support team and analysts with extensive experience in the use of model data for drift problems. SAROPS 1.0 currently uses Global NCOM. This product rated highly in all categories. Potential operational problems are related to system redundancy. This product is usable for offshore areas only, and is recommended for inclusion in the SAROPS EDS.

Product Provider: United States Navy, Naval Postgraduate School

Center / Department / Section: Center for Integrated Marine Technologies (CIMT)

Product Name: CIMT wind data/model

Parameters:	Area forecast	Summary	Surface wind speed/gusts
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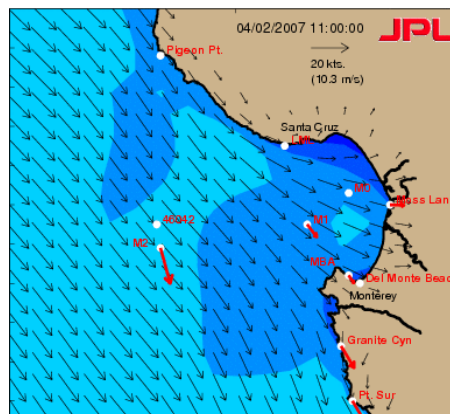
Product Type: Atmospheric Modeled

Funding Source: Public

Point of Contact Information:

Coverage: around Monterey Bay, CA

Name: Leslie Rosenfeld
Phone: 831-656-3253
Email: lkrosenf@nps.edu
Web site: <http://cimt.jpl.nasa.gov>



Description: The Center for Integrated Marine Technologies (CIMT) provides a demonstration surface wind product from Naval Postgraduate School for Monterey Bay. This product is aimed at the marine recreational user and shows surface winds from the COAMPS mesoscale atmosphere model along with measured winds from four ocean buoys and seven coastal stations. from CeNCOOS partner institutions. The model and measured wind vectors overlaid on model wind speed contours is updated hourly, and an animation shows the surface winds during the past 48 hours and the forecast winds for the upcoming 24 hours. The most recent observed wind speed and direction, along with station name and location pops up in a text box when the user mouses over the station location on the graphic. Time series plots comparing modeled with observed wind speed and direction for the past 48 hours, as well as forecast winds for the upcoming 48 hours are pulled up by clicking on any of measurement sites. The time series data are also presented as text listings. The same information, minus the measured winds, is also available for a subset of other model grid points. Background information about the observations, model, and the local meteorology for this area are also provided.

Near-real-time wind data are updated hourly. Plots and tabular data display observed and predicted winds for the past 48 hours and forecast winds for the next 24 hours. Time series at each station for 96 hours around the animation time are also available.

SAROPS Applicability: This product is presently operated as a demonstration project. It would not be well-suited for SAROPS use as presently operated. The combined data/model system could function well as a surface wind source if needed. This product is not recommended for inclusion in the SAROPS EDS.

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Product Provider: United States Navy, Naval Postgraduate School

Center / Department / Section: Center for Integrated Marine Technologies (CIMT)

Product Name: CIMT wind model/data

Parameters:	Area forecast	Summary	Surface wind speed/gusts
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Product Type: Atmospheric Observed

Funding Source: Public

Point of Contact Information:

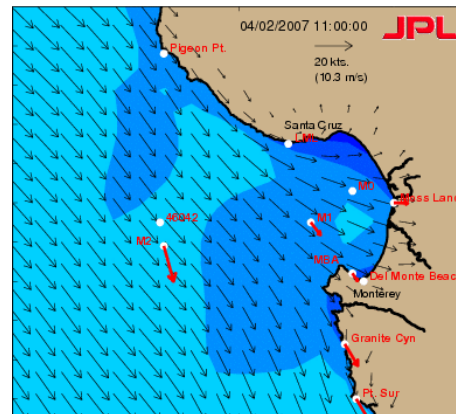
Coverage: around Monterey Bay, CA

Name: Leslie Rosenfeld

Phone: 831-656-3253

Email: lkrosenf@nps.edu

Web site: <http://cimt.jpl.nasa.gov>



Description: Wind measurements are available from three moorings in and near Monterey Bay, CA. Time series plots for the wind observations compared to the COAMPS model analysis and forecast winds can be accessed by clicking on the buoy location. The data are provided in tabular form as well.

SAROPS Applicability: The data from these stations are published on the Meteorological Assimilation Data Ingest System (MADIS), and would be available from NOAA. This product is not recommended for inclusion in the SAROPS EDS.

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Product Provider: United States Navy, Naval Postgraduate School

Center / Department / Section: Department of Oceanography.

Product Name: Central and Northern California Ocean Observing System (CeNCOOS), Coastal Ocean Currents Monitoring Program (COCMP).

Parameters: Sea-surface currents

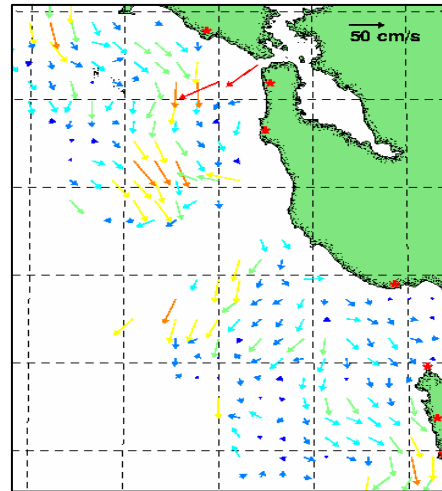
Product Type: Oceanographic Observed

Funding Source: Public

Point of Contact Information:

Coverage: Northern and Central CA

Name: Jeffrey Paduan
Phone: 831-656-3350
Email: paduan@nps.edu
Web site: <http://www.cencoos.org>



Description: The California Coastal Ocean Currents Monitoring Program (COCMP) is instrumenting the CA coastline with HF radar systems. Initial testing with NOAA and USCG has taken place as part of the Safe Seas 2006 oil spill exercise offshore San Francisco; additional integration is desirable. Answers here reflect the northern and central California portion of COCMP; additional groups are involved with maintaining instruments in southern California where the point of contact is Dr. Eric Terrill of Scripps Institute of Oceanography.

COCMP provides hourly updates of near-real-time ocean surface currents measured by High Frequency Radar. This site (<http://cencalcurrents.org/>) shows surface current vectors for Central California, including enlarged views of the Bodega, San Francisco, Año Nuevo, and Monterey areas. An experimental product shows 24-hour drift trajectories.

SAROPS Applicability: COCMP is an RA organized for the purpose of providing surface current data for the California coast. The data are available either from SIO, Rutgers, or NDBC. Once issues related to validation of the product through intercomparisons with other data sources, and possibly improvements to the reliability and accuracy of the product through refinements in the processing of returns are addressed, this and other HF products for the Pacific coast would be conditionally recommended for inclusion in the SAROPS EDS.

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Product Provider: United States Navy, Naval Research Laboratory (NRL)

Center / Department / Section: Ocean Dynamics and Prediction Branch

Product Name: IASNFS - Intra-Americas Sea Ocean Nowcast/Forecast System

Parameters:	Surface/subsurface currents	Surface/subsurface salinity
	Surface/subsurface temperature	Water level

Product Type: Oceanographic Modeled

Funding Source: Public

Point of Contact Information:

Coverage: Caribbean, Gulf of Mexico,
Straits of Florida

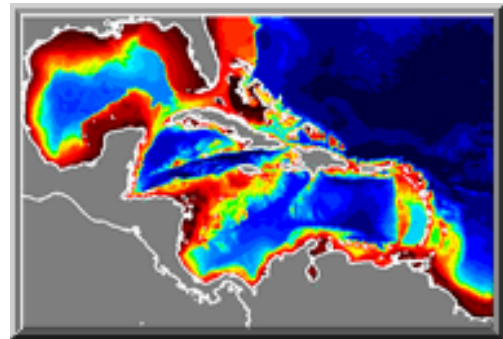
Name: Dong S. Ko

Phone: 228-688-5448

Email: ko@nrlssc.navy.mil

Web site:

http://www7320.nrlssc.navy.mil/IASNFS_WWW/



Description: Parameters modeled are sea level variation, ocean currents, temperature, and salinity. A nowcast and 72-hour forecast at 6-hour intervals are developed daily for the regions modeled: the Caribbean Sea, the Gulf of Mexico, and the Straits of Florida. Selected parameters are also available for sub-regions: the Mississippi Bight, the southwest Gulf of Mexico, the West Florida Shelf, and the Windward Passage.

Horizontal model resolution is 1/24 degree (about 6 km). Inputs include monthly river discharges, and outputs from a data analysis model (MODAS) for temperature/salinity. Surface forcing employs NOGGAPS/FNMOC surface heat fluxes, wind stresses, and sea level air pressure. NOGAPS forecasts are used to produce IASNFS forecasts.

Because this model is part of ongoing NRL research, results are not considered operational and data availability and timeliness are not guaranteed.

SAROPS Applicability: This product is considered to be a potentially useful information source. This product would be recommended as a replacement in the event that other model products are not available or usable. This product is conditionally recommended for inclusion in the SAROPS EDS.

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Product Provider: United States. Navy, Naval Research Laboratory (NRL)

Center / Department / Section:

Product Name: HYbrid Coordinate Ocean Model (HYCOM)

Parameters:	Surface/subsurface currents	Ice cover	Ice thickness
	Salinity	Sea surface/subsurface temperature	Water level

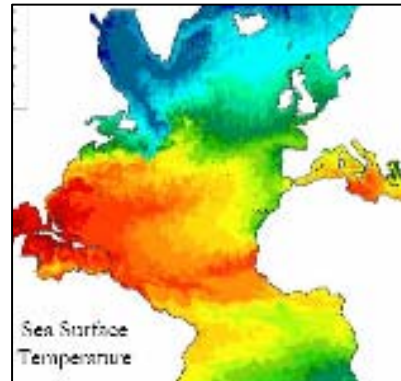
Product Type: Oceanographic Modeled

Funding Source: Public

Point of Contact Information:

Coverage: North and Equatorial Atlantic

Name: E. Joseph Metzger
Phone: 228-688-4762
Email: joe.metzger@nrlssc.navy.mil
Web site: <http://hycom.rsmas.miami.edu>



Description: The HYCOM consortium comprises multiple institutions involved in data-assimilative modeling. The consortium Web site describes HYCOM (Hybrid Coordinate Ocean Model) as a data-assimilative, hybrid isopycnal-sigma-pressure (generalized) coordinate ocean model. Its development and testing have been funded by the National Ocean Partnership Program (NOPP), in concert with the U.S. Global Ocean Data Assimilation Experiment (GODAE).

The Atlantic Basin model has a resolution of $1/12^\circ$ (approximately 9 km). Forecasts and nowcasts are made available within a day after the outputs are available. Multiple methods exist for accessing data, and boundary conditions can be automatically downloaded prior to starting a model run. An online archive of images, movies, and historical outputs is accessible.

SAROPS Applicability: The Web site references a product that is scheduled for transition to operations early in FY08. It is currently running in near real-time but has not been validated yet. When operational, the system will run daily and produce a 5-day forecast. The surface layer thickness will be 3 m. This system is conditionally recommended for inclusion in the SAROPS EDS and should be evaluated at a later date for SAROPS use.

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Product Provider: University of Alaska, Fairbanks (UAF)

Center / Department / Section: School of Fisheries and Ocean Sciences

Product Name: Surface Currents

Parameters: Sea-surface currents

Product Type: Oceanographic Observed

Funding Source: Public

Point of Contact Information:

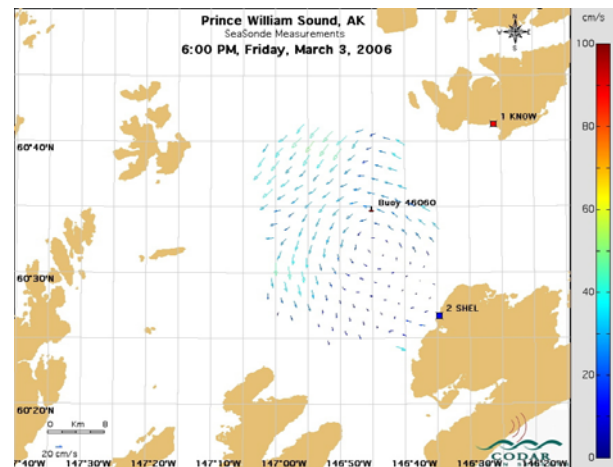
Coverage: Prince William Sound

Name: Rachel Potter

Phone: 907-474-5709

Email: rpotter@ims.uaf.edu

Web site: <http://www.ims.uaf.edu/salmon/>



Description: The Sea-Air-Land Modeling and Observing Network (SALMON) Project is located at the University of Alaska in Fairbanks, Alaska. In cooperation with other institutes, the SALMON project is providing continuous real-time or near real-time observations of physical oceanographic properties and linking these with models to provide ocean forecasts in much the same way that weather forecasts are made.

The UAF SALMON Project currently operates four High Frequency (HF) Radar sites in Alaska. One 13-MHz site is located in Prince William Sound and two sites are located on the Arctic Ocean near Prudhoe Bay. The Prudhoe Bay system runs from June through the middle of October. These two sites can operate at either 12 or 25 MHz.

The 25-MHz system has a 40-km range with a 1-km resolution and the 12-13 MHz systems have a 70-km range with a 3-km resolution.

The site operating in Prince William Sound is located in Knowles Bay, north of Orca Bay and also just north of Shelter Bay on Hinchinbrook Island. The site has a clear view of central Prince William Sound. The PWS site is presently not operational, however.

Funding for these systems is being provided by grants awarded by the National Aeronautical and Space Administration (NASA), National Oceanic and Atmospheric Administration (NOAA), the Prince William Sound Regional Citizens Advisory Corporation and the Alaska Ocean Observing System (AOOS).

The data from both installations were downloaded every hour to Fairbanks where the data were processed and made available within an hour. The data are available as images (JPEG) of hourly values and could be made available in other formats.

The two HF Radars located at Prudhoe Bay will be relocated to the Cook Inlet where they will collect data for one year. The coverage will be for lower Cook Inlet, just outside Kachemak Bay, the two radars will be set up at Nanwalek and Anchor Point.

This program will study the spatial and temporal variability of the currents using HF Doppler radar. This program is sponsored by the Minerals Management Service, the National Ocean and Atmospheric Administration, and the National Oceanographic Partnership Program. The study will be conducted in cooperation with the Alaska Ocean Observing System.

SAROPS Applicability: SALMON potentially has solid funding sources to maintain long-term deployment. The integration of the data in SAROPS would be relatively straightforward. The data quality score reflects the opportunity for improvement of real-time quality checks. This product is presently not operational, however, and is not recommended for inclusion in the SAROPS EDS at this time.

Product Provider: University of California, Davis (UCD), Bodega Marine Laboratory

Center / Department / Section:

Product Name: Bodega Ocean Observing Node (BOON)

Parameters:	Sea-surface currents Water level	Salinity	Sea surface/subsurface temperature
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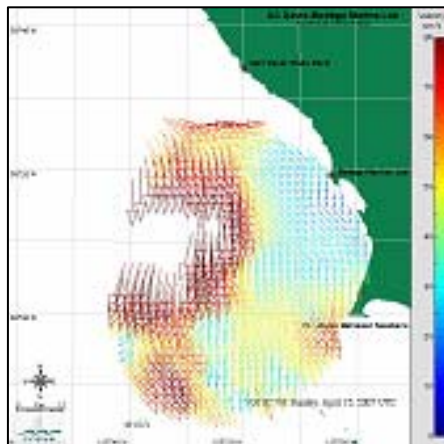
Product Type: Oceanographic Observed

Funding Source: Public

Point of Contact Information:

Coverage: Northern California Coast

Name: John Largier
Phone: 707-875-1930
Email: jlargier@ucdavis.edu
Web site: <http://bml.ucdavis.edu/boon/>



Description: BOON operates three HF radar stations: Bodega Bay, Point Reyes, and Gerstle Cove, CA. The HF radar surface current data product covers the area off Bodega Marine Laboratory and Point Reyes, and is updated hourly. Seawater temperature and salinity are measured at one station in the Bodega Marine Reserve. Information is available on www.bml.ucdavis.edu/boon, but this site does not show newer deployments of (i) moorings on Cordell Bank and immediately offshore of Bodega Head which provide currents through the water column as well as temperature, salinity and wind data, (ii) long-range HF radar at Bodega Bay and Point Arena, covering the area from Pt Reyes to Pt Arena, and (iii) shoreline data on temperature and salinity at Fort Point (mouth of San Francisco Bay).

SAROPS Applicability: Environmental data are provided by Bodega Marine Laboratory/BOON with the understanding that they are not guaranteed to be correct or complete. This system is in development and is not yet operational. Given the system's state of readiness, the scoring above appears to be liberal. Data from this system is available through the COCMP at SIO. We recommend that the performance of this product be further examined through intercomparisons with other data sources before it is incorporated into SAROPS. This product is conditionally recommended for inclusion in the SAROPS EDS.

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Product Provider: University of California - San Diego, Scripps Institution of Oceanography (SIO)

Center / Department / Section: Marine Physical Laboratory, Coastal Observing Research and Development Center (CORDC)

Product Name: Coastal Observing Research and Development Center (CORDC) Surface Current Data Management System

Parameters: Sea-surface currents

Product Type: Oceanographic Observed

Funding Source: Public

Point of Contact Information:

Coverage: East and West Coast

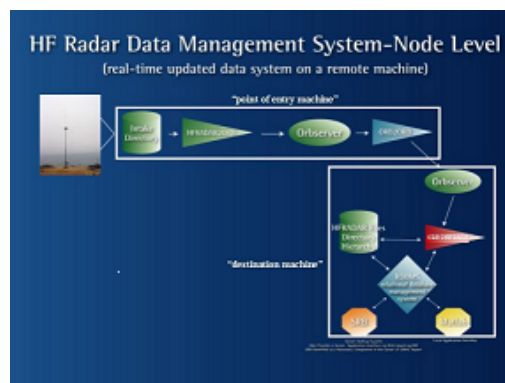
Name: Mark Otero

Phone: 858-822-3537

Email: motero@mpl.ucsd.edu

Web site:

<http://cordc.ucsd.edu/projects/mapping/maps/>



Description: CORDC provides a data management structure for viewing near-real-time surface current data derived from HF radar measurements at 75 sites on the coast of North America. Near-real time surface current vectors described here are estimated from aggregated surface radial velocity measurements made by HF radar. Surface radial data is aggregated and total vector products are produced through the HF radar Network.

SAROPS Applicability: This site SIO integrates HF data for the west coast HF radar systems. The system is in a developmental stage, as the Web site cautions: "This is a research project and may contain errors. Please contact with the providers of this data to ensure accurate values before making any critical judgments." At present, the most recent data displayed are several hours behind the present. The data include u and v component magnitudes and direction. We recommend that the performance of the component systems shown on this site product be further examined through intercomparisons with other data sources before it is incorporated into SAROPS.

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Product Provider: University of California, San Diego (UCSD), Scripps Institution of Oceanography

Center / Department / Section: Marine Physical Laboratory

Product Name: Near-Real Time Surface Currents – CA

Parameters: Sea-surface currents

Product Type: Oceanographic Observed

Funding Source: Public

Point of Contact Information:

Coverage: Southern California

Name: Mark Otero

Phone: 858-822-3537

Email: motero@mpl.ucsd.edu

Web site: <http://www.sccoos.org/data/hfrnet/>



Description: HF radar derived surface current measurements (CODAR) are provided as part of the Southern California Coastal Ocean Observing System (SCCOOS). SCCOOS brings together coastal observations along the Southern California Bight to provide information to address coastal water quality, marine life resources, and coastal hazards issues. Working interactively with local, state and federal agencies, resource managers, policy makers, educators, scientists and the general public, SCCOOS will improve understanding and delivery of coastal observations, and will allow better management of the coastal ocean environment.

SCCOOS is principally funded by the California State Coastal Conservancy and the National Oceanic and Atmospheric Administration. Additional funds are provided by various organizations for focus projects by several other local, State, and Federal Agencies and private interests.

Interactive requests for observed/measured and modeled/predicted metocean data are available in the SCCOOS Web site.

SAROPS Applicability: This product is not yet considered operational. Its QA score is very good, given its present focus. We recommend that the performance of this product be further examined through intercomparisons with other data sources before it is incorporated into SAROPS. This product is conditionally recommended for inclusion in the SAROPS EDS.

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Product Provider: University of California, San Diego (UCSD), Scripps Institution of Oceanography

Center / Department / Section: Ocean Engineering Research Group

Product Name: CDIP Wave Buoys

Parameters:	Sea surface/subsurface temperature	Wave direction
	Wave max height	Wave peak period
	Wave significant height	White cap probability

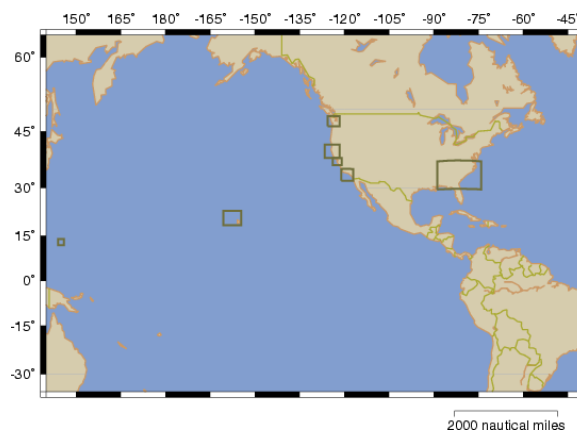
Product Type: Oceanographic Observed

Funding Source: Public

Point of Contact Information:

Coverage: Various Coastal U.S.

Name: Julie Thomas
Phone: 858-534-3034
Email: jot@splash.ucsd.edu
Web site: <http://cdip.ucsd.edu>



Description: The Coastal Data Information Program (CDIP) has active wave stations in:

- Washington State (1)
- Oregon (1)
- California – North (3)
- California - Central (2)
- California - South (14)
- East Coast (1)
- Hawaii (1)
- Guam (1)
- Brazil (1)

There are two general classes of products available: 9-band products and parameter products. The parameter and 9-band products differ in how they measure the peak period (T_p) and peak direction (D_p) of a station's wave data. (Temperatures and wave heights (H_s) are identical in the parameter and 9-band products.) The basic difference is that while the 9-band processing divides all the wave energy for a station into nine broad wave-period bands, the parameter products divide the energy into many – generally 64 or 128 – small bands. As a result, the 9-band values give a broader, more general peak value, which the parameter products pick up finer, more-subtle peaks in the data. The data are available in near-real time in a variety of documented formats.

SAROPS Applicability: This is a useful source of wave observation data for specific coastal areas. This product is conditionally recommended as a supplemental information source for SAROPS. The buoy data may be obtained from NDBC.

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Product Provider: University of California, San Diego (UCSD), Scripps Institution of Oceanography

Center / Department / Section: Ocean Engineering Research Group

Product Name: Coastal Data Information Program (CDIP) Wave Models

Parameters:	Wave direction	Wave max height	Wave peak period
	Wave significant height	White cap probability	

Product Type: Oceanographic Modeled

Funding Source: Public

Point of Contact Information:

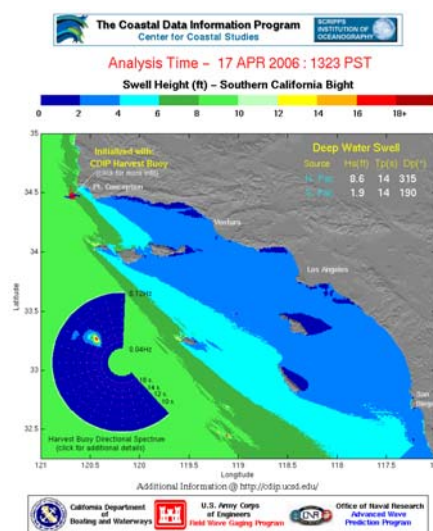
Coverage: Southern California

Name: Julie Thomas

Phone: 858-534-3034

Email: jot@splash.ucsd.edu

Web site: <http://cdip.ucsd.edu>



Description: The NOAA/NCEP/CDIP (Coastal Data Information Program) coastal wave forecast model forecasts are actually the combined result of two wave models:

- The NOAA/NCEP implementation of the Wave Watch III wave model for deep water regions (depth > 300 m). The Wave Watch III model is a wind-wave generation and propagation model. That is, the global wave forecasts are made based on global surface wind forecasts.
- The Coastal Data Information Program's (CDIP) implementation of a spectral refraction-diffraction wave model for shallow water (10 m < depth < 300 m). This is a propagation-only model (no wind-wave generation) that models the effect of bathymetry (underwater topography) on waves as they travel from deep water towards the coast. This implementation is slightly different than the swell version. It also includes the propagation (but not generation) of shorter period local seas based on input from the Wavewatch III model.

Every 12 hours, CDIP receives detailed wave forecasts from NOAA for two deep water locations: 34° N, 121° W (near Pt. Conception); and 37° N, 123° W (off Monterey Bay). The forecast data are modified slightly to be more compatible with the CDIP wave model, and more consistent with recent wave conditions measured near these two locations. The modified

forecasts are used to initialize the CDIP wave propagation model and make predictions of wave heights across the continental shelf to the coast (10 m water depth).

Reference Sites:

<http://polar.ncep.noaa.gov/waves/>

<http://cdip.ucsd.edu/?nav=documents&sub=faq&xitem=nowcast>

SAROPS Applicability: This is a reliable and useful source of wave forecast data for the Southern California region, and is recommended for inclusion in the SAROPS EDS.

Product Provider: University of California, Santa Barbara (UCSB), Marine Science Institute
Center / Department / Section:
Product Name: UCSB Ocean Surface Currents Mapping Project

Parameters: Sea-surface currents

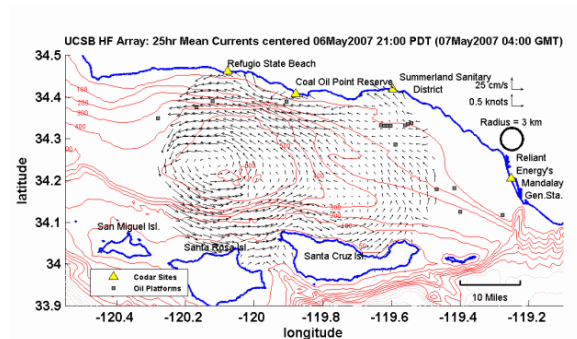
Product Type: Oceanographic Observed

Funding Source: Public

Point of Contact Information:

Coverage: Santa Barbara Channel, CA

Name: Brian Emery
Phone: 805-893-8480
Email: emery@icess.ucsb.edu
Web site: <http://www.oceancurrentmaps.net>



Description: HF Radar array. See <http://www.oceancurrentmaps.net> or <http://www.sccoos.org>.

This system has four coastal HF radars that produce surface currents in the area north of the Channel Islands east from Santa Barbara to near Oxnard. The system is still in development.

The Web site disclaimer states that the ocean current measurements are experimental and should not be relied upon as a primary source of ocean current information. Improvements in data coverage appear to be necessary.

SAROPS Applicability: This system is part of the SCCOOS and COCMP networks that are under development. The quality of data for this area would benefit from additional transmitter sites and from validation against other measurements and drifters. We recommend that the performance of this product be further examined through intercomparisons with other data sources before it is incorporated into SAROPS. This product is conditionally recommended for inclusion in the SAROPS EDS

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Product Provider: University of Connecticut, Marine Sciences Department

Center / Department / Section:

Product Name: Long Island Sound Integrated Coastal Observing System (LISICOS)

Parameters:	Sea-surface currents	Salinity	Sea surface/subsurface temp
	Wave direction	Wave max height	Wave peak period
	Wave significant height		

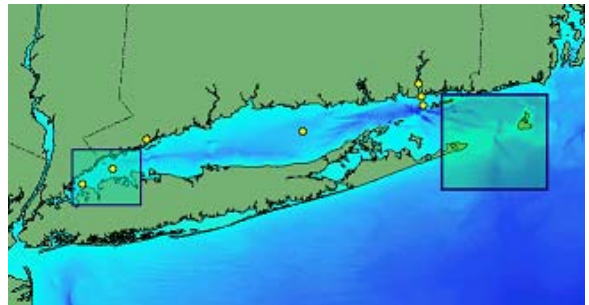
Product Type: Oceanographic Observed

Funding Source: Public

Point of Contact Information:

Coverage: Long Island/Block Island Sound

Name: Adam Houk
Phone: 860-405-9167
Email: adam.houk@uconn.edu
Web site: <http://lisicos.uconn.edu>



Description: The program is described in better detail on the LISICOS Web site (<http://lisicos.uconn.edu>). Funded by NOPP, LISICOS is intended to provide real-time data and forecasts of information on circulation and water quality important to issues in managing Long Island Sound (LIS). A system of seven stations in LIS and adjacent estuaries provides information on weather, water quality, and waves. High-frequency radar is used to obtain sea-surface current information for two locations: Western LIS and Block Island Sound (BIS). The Web site also has 24-hour tidal current predictions for LIS, BIS, and the waters south of Long Island.

The real-time data are considered provisional. They have not been reviewed or edited, other than removal of points outside the range for a specific parameter.

SAROPS Applicability: The Web site shows eight stations, with seven located in Long Island Sound. The LIS stations in location useful for SAROPS (e.g., New London Ledge Light, Central Long Island Sound, Western Long Island Sound, and Execution Rocks) are available from NDBC.

The meteorological data from this system is also reported by MADIS and would be available from NOAA. When the site was checked, the BIS CODAR was not operating. The CODAR system is presently in a development state. This product is not recommended for inclusion in the SAROPS EDS at this time.

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Product Provider: University of Delaware, College of Marine and Earth Studies

Center / Department / Section:

Product Name: Delaware Bay Mouth HF Radar Network

Parameters: Sea-surface currents

Product Type: Oceanographic Observed

Funding Source: Public

Point of Contact Information:

Coverage: Mouth of Delaware Bay

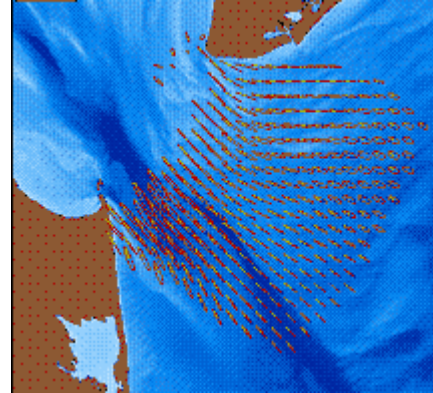
Name: Bruce Lipphardt Jr.

Phone: 302-831-6836

Email: brucel@udel.edu

Web site:

http://laplace.cms.udel.edu/~brucel/HF_radar_results/



Description: The system consists of two HF radar sites at the mouth of the Delaware Bay.

When it was evaluated, the Web site showed only historical data:

- Radial velocities (initial installation results 27–28 Sept 2006)

- Total velocities (same dates)

- Measured antenna patterns (no date)

- Tidal current ellipses (12/11/06–1/9/07)

SAROPS Applicability: The Web site does not appear to be updated regularly with real-time data. This system is not recommended for inclusion in the SAROPS EDS.

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Product Provider: University of Delaware, College of Marine and Earth Studies

Center / Department / Section:

Product Name: Delaware Bay Observing System (DBOS)

Parameters:	Sea-surface currents	Salinity	Sea surface/subsurface temp
	Wave direction	White cap probability	

Product Type: Oceanographic Observed

Funding Source: Non-profit

Point of Contact Information:

Coverage: Delaware Bay

Name: Mohsen Badiey
Phone: 302-831-3687
Email: badiey@udel.edu
Web site: <http://www.udel.edu/dbos/>



Description: DBOS makes measurements of winds, salinity, temperature and currents (via ADCP) at the Fourteen Ft. Light in central Delaware Bay. DBOS also includes a CODAR installation that is evaluated separately.

SAROPS Applicability: The near-real time data on the Web site are for June 9, 2005. The POC indicated that wave direction and white cap probability are measured, but it is not clear how wave information is measured by this system. This system is not considered ready for inclusion in the SAROPS EDS.

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Product Provider: University of Georgia, Skidaway Institute of Oceanography (SkIO)

Center / Department / Section: Physical Oceanography

Product Name: South Atlantic Bight Synoptic Offshore Observational Network (SABSOON)
Observing System

Parameters:	Sea-surface currents Water level	Salinity Wave max height	Sea surface/subsurface temperature Wave peak period
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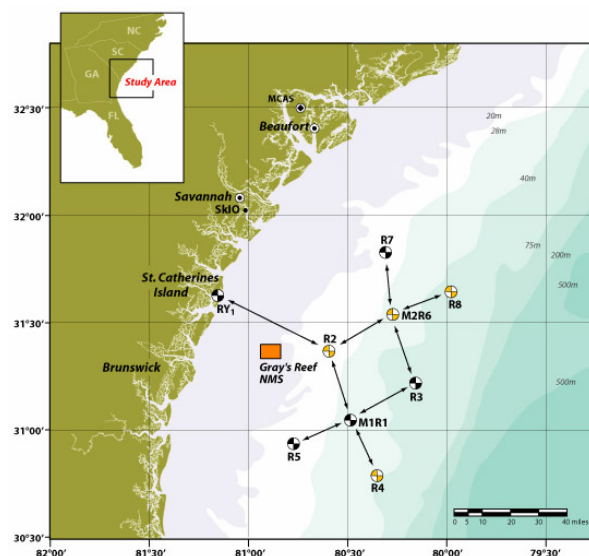
Product Type: Oceanographic Observed

Funding Source: Public

Point of Contact Information:

Coverage: South Carolina, Georgia

Name: Trent Moore
Phone: 912-598-3308
Email: trent.moore@skio.usg.edu
Web site:
<http://www.skio.peachnet.edu/research/sabsoon/tower.php>



Description: A severe shortage of sustainable funding for the SABSOON initiative has forced cutbacks in personnel to maintain and augment the system. Currently they have only one of three observing towers operating, but they are planning to restart the two "dead" towers. They also operate a WERA surface current system, with a graphic data display, that has just been made available on the Web. Waves, better coverage and more efficient data sharing will become available if funding sources can be found.

SAROPS Applicability: At the time this system was examined, only one SABSOON tower was operating, so this system is not stable at this time. Plans for the system include instrumenting eight offshore platforms. Surface current data are potentially available. The WERA system consists of two shore-based HF radars funded by SEACOOS. When we checked the site, we found the most recent frame in the output loop was about 19-hours old. The Web site states that there is low coverage from 8:00-11:30 AM local time when background AM, FM and amateur-radio-activity noise peaks. SkIO also mention of a known problem with one of the radars at specific ranges; they are working to resolve this problem.

We recommend that the performance of this product be further examined through intercomparisons with other data sources before it is incorporated into SAROPS. This product is conditionally recommended for inclusion in the SAROP EDS.

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Product Provider: University of Maine

Center / Department / Section: School of Marine Sciences

Product Name: Gulf of Maine Ocean Currents Model

Parameters: Salinity
Sea surface/subsurface temperature
Water level

Sea-surface currents
Turbulent dispersion coefficient

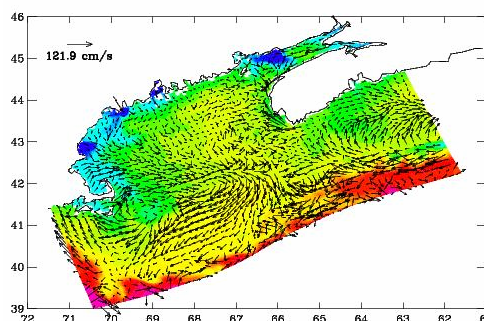
Product Type: Oceanographic Modeled

Funding Source: Public

Point of Contact Information:

Name: Stephen Cousins
Phone: 207-581-4302
Email: cousins@umit.maine.edu
Web site:
<http://rocky.umeoce.maine.edu/GoMPOM/>

Coverage: Gulf of Maine



Description: This project carries out simultaneous prognostic integration of a three-dimensional circulation model coupled with a seven-component biological model. It considers the interaction of the important physical, chemical, and biological factors that control biological productivity in the Gulf of Maine.

The Princeton Ocean Model (POM) is used to study the circulation in the Gulf of Maine and its seasonal transition in response to wind, surface heat flux, river discharge, and M2 tide. The model uses a curvilinear coordinate system in the horizontal with variable spacing from 3 km nearshore to 7 km offshore, and 19 levels in the vertical. It is initialized and forced at the open boundary with model results from the East Coast Forecast System. The first experiment is forced by monthly climatological wind and heat flux from the Comprehensive Ocean Atmosphere Data Set (COADS); discharges from the Saint John's, Penobscot, Kennebec, and Merrimack rivers are added in the second experiment; semidiurnal lunar tide (M2) is included as part of the open boundary forcing in the third experiment.

The model has 103 x 151 horizontal grid points and 19 vertical levels to map the Gulf of Maine, Georges Bank, and Scotian Shelf, and the adjacent slope region, with realistic topography to the 4500-meter isobath.

SAROPS Applicability: Regional high-resolution hydrodynamic models are of particular use to SAROPS and this product would fill data gaps for the Gulf of Maine. It appears that the wind forcing is climatological and the use of operational meteorological forecasts could make the results more robust for SAR modeling. The site provides predictions and nowcasts for an area that is well measured, making it recommended for inclusion into the SAROPS EDS.

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Product Provider: University of Maine, School of Marine Sciences (SMS)

Center / Department / Section: Physical Oceanography Group

Product Name: Gulf of Maine Ocean Observing System (GoMOOS) Buoys

Parameters:	Atmospheric pressure Visibility	Summary Surface Wind speed/gusts	Air temperature
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Product Type: Atmospheric Observed

Funding Source: Public

Point of Contact Information:

Coverage: Gulf of Maine

Name: Linda Mangum

Phone: 207-581-4320

Email: ljm@umeoce.maine.edu

Web site: <http://www.gomoos.org>

<http://gyre.umeoce.maine.edu/GoMOOS/gommrg.phtml>



the SAROPS EDS. The CODAR data (mentioned separately) should be combined with the point measurements provided by this product.

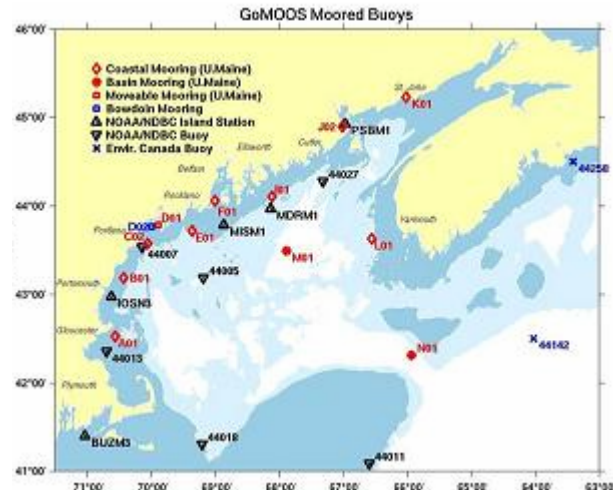
Product Name: Gulf of Maine Ocean Observing System (GoMOOS) Buoys

Parameters:	Sea-surface currents	Salinity	Sea surface/subsurface temperature
	Wave significant height		

Funding Source: Public

Coverage: Gulf of Maine

Name: Linda Mangum
Phone: 207-581-4320
Email: ljm@umeoce.maine.edu
Web site: <http://www.gomoos.org> or
[http://gyre.umeoce.maine.edu/GoMoos/gom
mrg.phtml](http://gyre.umeoce.maine.edu/GoMoos/gom
mrg.phtml)



The data are sent from the buoys every hour, using three communication mechanisms for redundancy: cell phone, satellite, and GOES Backup. Every 6 months, data are downloaded from the buoy and made available. The data archive is available all the way back to the program start in 2001. GoMOOS hosts Web Mapping Service (WMS) servers for winds, waves, and water temperature. The meteorological data are measured at 3 m. The program's funding is not long term, but relies on year-to-year earmarks. There is some concern that the buoy observation program may have to be reduced in the future.

SAROPS Applicability: The mission of GoMOOS as reflected in its low scores for operational status and data quality does not dovetail well with USCG mission needs. This system provides observational data for an area that is not well measured. Much of the data is available from NDBC; however, some stations are not otherwise available. The data from this system is useful as a supplemental SAR data source. To the extent possible, this system should be made available to SAROPS. This product is recommended for inclusion in the SAROPS EDS.

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Product Provider: University of Maine, Physical Oceanography Group

Center / Department / Section: School of Marine Sciences

Product Name: Gulf of Maine Ocean Observing System (GoMOOS) CODAR

Parameters: Sea-surface currents

Product Type: Oceanographic Observed

Funding Source: Public

Point of Contact Information:

Coverage: Gulf of Maine

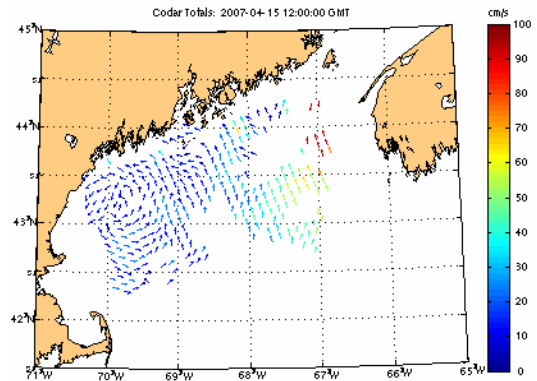
Name: Linda Mangum

Phone: 207-581-4320

Email: ljm@umeoce.maine.edu

Web site: <http://www.gomoos.org/codar>

<http://gyre.umeoce.maine.edu/gomoos/codar>



Description: The GoMOOS CODAR Program is operated by the University of Maine's Physical Oceanography group: <http://gyre.umeoce.maine.edu/gomoos/codar>.

Contact buoy-webmaster@umeoce.maine.edu for questions.

SAROPS Applicability: This system is conditionally recommended for incorporation into the SAROPS EDS. Improvements in system reliability and data quality are needed. In our judgment, the system is presently being run as a demonstration project and would require funding to harden and add stations to improve its coverage and reliability. As in the case of other CODAR systems, additional discussions between USCG and GoMOOS system operators are needed to ensure that the information provided by the system can accurately reproduce search objects in the Gulf of Maine.

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Product Provider: University of Maryland, Center for Environmental Studies (UMCES)

Center / Department / Section:

Product Name: Chesapeake Bay Observing System (CBOS) Meteorological

Parameters:	Relative humidity	Air temperature	Surface Wind speed/gusts
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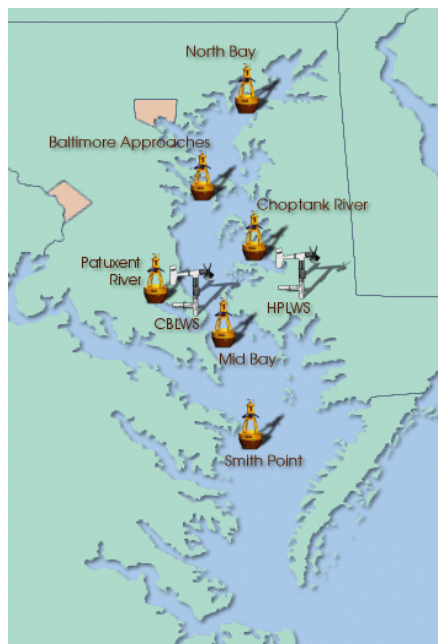
Product Type: Atmospheric Observed

Funding Source: Non-profit

Point of Contact Information:

Coverage: Chesapeake Bay

Name: Carole Derry
Phone: 410-221-8451
Email: cderry@hpl.umces.edu
Web site: <http://www.cbos.org>



Description: The CBOS buoys measure a variety of oceanographic parameters including water temperature, salinity, turbidity, water currents and waves. Availability of data varies with funding availability.

SAROPS Applicability: When checked, the Web site map showed two weather stations. Only one weather station was operating. This system is still in development state and is not ready for inclusion in the SAROPS EDS at this time.

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Product Provider: University of Maryland, Center for Environmental Studies

Center / Department / Section:

Product Name: Chesapeake Bay Observing System (CBOS) Oceanographic

Parameters:	Sea-surface currents	Salinity	Sea Surface/subsurface temp
	Turbidity	Wave direction	Wave max height
	Wave peak period	Wave significant height	

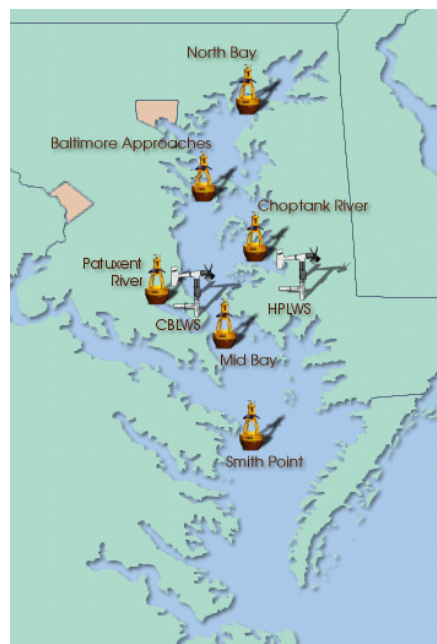
Product Type: Oceanographic Observed

Funding Source: Non-profit

Point of Contact Information:

Coverage: Chesapeake Bay

Name: Carole Derry
Phone: 410-221-8451
Email: cderry@hpl.umces.edu
Web site: <http://www.cbos.org>



Description: The user did not provide answers for this part of the CBOS system.

SAROPS Applicability: The Web site map shows six buoys. When checked by the R&DC, only two of the six buoys were listed as “live” on the Web site; however only one “live” buoy was apparently operating. This system is still in a development state and is not ready for inclusion in the SAROPS EDS at this time.

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Product Provider: University of Miami, Rosenstiel School of Marine and Atmospheric Sciences (RSMAS)

Center / Department / Section: Ocean Prediction Experimental Laboratory / Applied Marine Physics (OPEL/AMP)

Product Name: Eastern Florida Shelf High Frequency Radar

Parameters: Sea-surface currents

Product Type: Oceanographic Observed

Funding Source: Private

Point of Contact Information:

Coverage: Key Largo to Key Biscayne, FL

Name: Lynn K. Shay

Phone: 305-421-4075

Email: nshay@rsmas.miami.edu

Web site: <http://iwave.rsmas.miami.edu/wera/>

Description: The University of Miami/Rosenstiel School of Marine and Atmospheric Sciences is currently operating two WERA High Frequency radars in Key Largo and Crandon Park on Key Biscayne. The radars transmit at 16 MHz and provide measurement of currents on the ocean's surface over a large area of the ocean off Miami, FL.

SAROPS Applicability: This system and the RSMSAS EFSIS provide complementary information on surface currents along the Atlantic coast of southern Florida. They represent the best surface current data set for this area. Once issues related to validation of the product through intercomparisons with other data sources (and possibly improvements to the reliability and accuracy of the product through refinements in the processing of returns) are addressed, this and other HF products for the Pacific coast would be recommended for SAROPS. This product is presently conditionally recommended for inclusion in the SAROPS EDS.

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Product Provider: University of Miami - Rosenstiel School of Marine and Atmospheric Science (RSMAS)

Center / Department / Section: [Ocean Prediction Experimental Laboratory](#) / Applied Marine Physics (OPEL/AMP)

Product Name: East Florida Shelf Information System (EFSIS)

Parameters:	Sea-surface currents	Salinity	Sea surface/subsurface temperature
	Turbulent dispersion coefficient		Turbulent kinetic energy
	Turbulent velocity variance		Water level

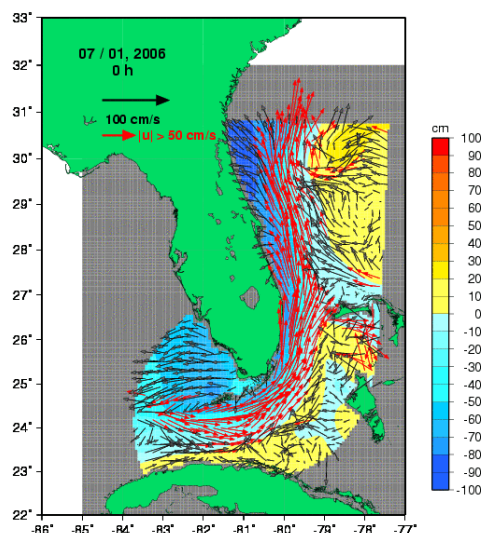
Product Type: Oceanographic Modeled

Funding Source: SEACOOS

Point of Contact Information:

Name: Dr. Christopher Mooers
Phone: 305-421-4088
Email: cmooers@rsmas.miami.edu
Web site: <http://efsis.rsmas.miami.edu>

Coverage: East Florida Shelf



Description: EFSIS is based on the Princeton Ocean Model (POM), which is a free surface, hydrostatic, sigma coordinate, primitive equation ocean circulation model with a Mellor-Yamada 2.5 turbulence closure scheme. POM is configured for the East Florida Shelf in a curvilinear coordinate system of 223 x 97 horizontal grid points with 25 vertical sigma levels and is called EFS-POM. EFS-POM is forced by surface atmospheric forcing (wind, heating/cooling, sea level pressure) and by boundary forcing derived from Global NCOM and a barotropic tidal model.

The barotropic tidal model encompasses EFS-POM grid points as its interior points (251 x 101) and thus is slightly larger than EFS-POM domain. Boundary conditions are derived from harmonic constants of four major semi-diurnal (M2, S2, N2, K2) and four major diurnal (O1, K1, P1, Q1) tidal constituents. Sea level fluctuations are derived at open boundaries of the tidal model, which then are used to force the tidal model along with tidal potential forcing in the interior. The 12-km resolution NCEP NAM-eta (North American Meso) model products (winds and sea level pressures) are used for the atmospheric forcing.

EFSIS is initialized with a one day hindcast run. The forecast run is three-and-half days long and forced by three hourly NAM forecast winds and sea level pressures.

EFSIS is run four times per day and produces output data with a 1-hour time step. The output files are stored in NetCDF format and can be made available via FTP.

SAROPS Applicability: The use of a high-resolution oceanographic model provides valuable data for SAR planning. This is a sophisticated model system, although no data assimilation is performed. It provides no nowcast product and no uncertainties for the data; however the model results are checked against data on an ongoing basis. The data are available in a format that can be readily accessed by SAROPS. This product is recommended for inclusion in the SAROPS EDS.

Product Provider: University of Miami - Rosenstiel School of Marine and Atmospheric Science (RSMAS)

Center / Department / Section: Ocean Prediction Experimental Laboratory/Department of Applied Marine Physics

Product Name: Extended Prince William Sound Nowcast/Forecast System (EPWS/NFS)

Parameters: Sea-surface currents	Salinity
Sea surface/subsurface temperature	Turbulent dispersion coefficient
Turbulent kinetic energy	Turbulent velocity variance
Water level	

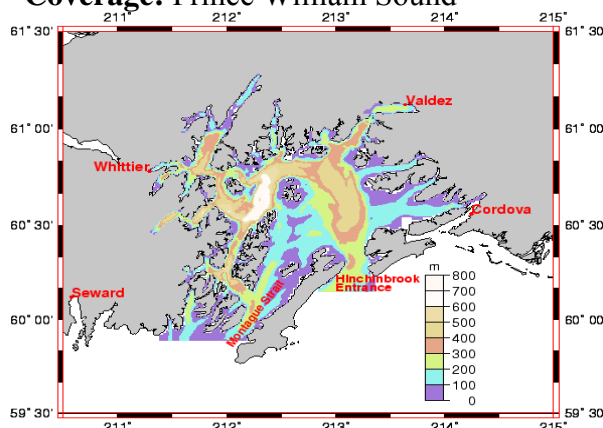
Product Type: Oceanographic Modeled

Funding Source: Private (OSRI)

Point of Contact Information:

Name: Dr. Christopher Mooers
Phone: 305-421-4088
Email: cmooers@rsmas.miami.edu
Web site: <http://epws-nfs.rsmas.miami.edu>

Coverage: Prince William Sound



Description: The EPWS-NFS is based on the Princeton Ocean Model (POM). The grid size is 1/100th degree in latitude and 1/50th degree in longitude (~1.1 km at 60° N), which is small enough to resolve mesoscale eddies. There are 26 sigma (bottom-following) levels in the vertical direction. Tidal currents are computed with a density-homogeneous version of the NFS-POM which is forced by sea level oscillations at the open boundaries composed of four major semi-diurnal constituents (M2, S2, N2, K2,) and four major diurnal constituents (K1, O1, P1, Q1). Tidal harmonics (amplitudes and phases) of these constituents are obtained from a global tidal model. Boundary conditions are provided by Global NCOM, which is run at NAVOCEANO daily.

Wind stress is computed from hourly wind speed and direction of the Regional Atmospheric Modeling System (RAMS) using a formula by Large and Pond (1981). The RAMS grid has a spatial resolution of 4 km and forecasts up to 48 hours and is provided by Prof. Peter Olsson, University of Alaska Anchorage. Heating and cooling is given by the climatological monthly heat flux from COADS (Comprehensive Ocean and Atmospheric Data Set). Monthly fresh water flux is derived from a hydrological model (Simmons 1996) plus precipitation is applied at the surface of the grid points next to the land. A 3-day ocean forecast is performed each day. The output has a 1-hour time step, is stored in NetCDF format, and can be made available via FTP.

SAROPS Applicability: The use of high-resolution meteorological and oceanographic models provides valuable data for SAR planning. This is a complex model system. Reliability and redundancy scores are fair. No data assimilation is performed, nor is the model checked against data on an ongoing basis. The data are available in a format that can be readily accessed by SAROPS. The site provides predictions and nowcasts for an area that is not well measured, making it recommended for inclusion in the SAROPS EDS.

Product Provider: University of North Carolina (UNC)-Chapel Hill

Center / Department / Section: Marine Sciences

Product Name: Advanced Circulation Model (ADCIRC)

Parameters: Sea-surface currents

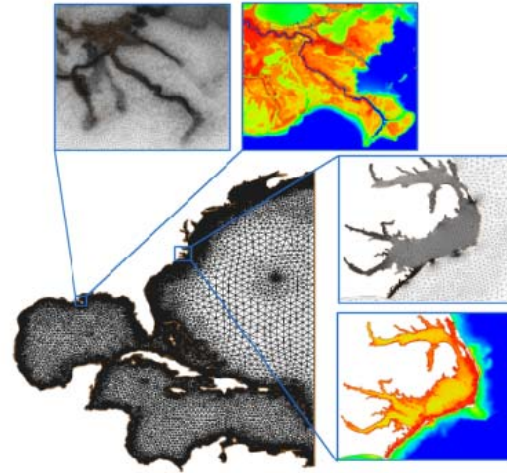
Product Type: Oceanographic Modeled

Funding Source: Public

Point of Contact Information:

Name: Rick Luettich
Phone: 252-726-6841 ext. 137
Email: Rick_Luettich@unc.edu
Web site:
<http://www.adcirc.org>

Coverage: East Coast and Gulf of Mexico



Description: ADCIRC is a system of computer programs for solving time dependent, free surface circulation and transport problems in two and three dimensions. These programs utilize the finite element method in space allowing the use of highly flexible, unstructured grids. Typical ADCIRC applications have included: (i) modeling tides and wind driven circulation, (ii) analysis of hurricane storm surge and flooding, (iii) dredging feasibility and material disposal studies, (iv) larval transport studies, (v) near shore marine operations.

UNC runs ADCIRC operationally once a day. The model is driven by winds from NOAA NCEP's NAM product and tidal boundary conditions (TOPEX Poseidon tidal constituents) west of 60° W longitude. The grid is a flexible mesh where deep ocean grid cells have a typical 25-km size, and shelf grid cells are 3-5 km. The model does not really resolve estuaries, and is most useful on the continental shelf where tides are dominant.

The model produces an 84-hour forecast with a 1-hour time step. The output format is NetCDF and the data are available to users, typically at 0700Z, via an OPeNDAP server. Data are also made available on Local Data Manager (LDM) for the SURA/SCOOP project. Data assimilation is not currently performed.

SAROPS Applicability: This model product is of great value to SAR operations as it resolves surface currents at a high spatial resolution in the coastal zone (inside the shelf) for a large coverage area. It does not provide good resolution for problems inside estuaries and would need to be combined with regional models for these estuaries. The data are published in a format that would make it readily accessible by SAROPS. SAROPS 1.0 currently uses a tidal constituent version of ADCIRC that could be replaced with this operational version.

In their response, UNC indicated that they are in the process of making changes such as providing uncertainty estimates with output fields and refining the vertical and horizontal spatial resolution of the product. These changes will improve the rating. This product is recommended for inclusion in the SAROPS EDS.

Product Provider: University of North Carolina (UNC)-Chapel Hill

Center / Department / Section: N/A

Product Name: CODAR – Sea Surface Radar Measurements

Parameters: Sea-surface currents

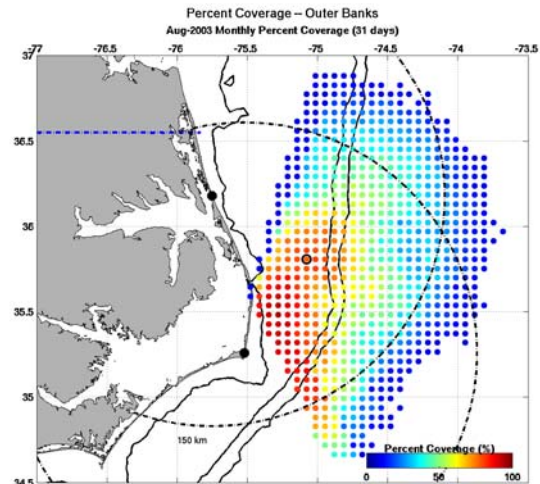
Product Type: Oceanographic Observed

Funding Source: Not provided

Point of Contact Information:

Coverage: North Carolina Outer Banks

Name: Michael Muglia
Phone: 252-480-8581 ext. 227
Email: muglia@email.unc.edu
Web site: <http://nccoos.org>



Description: The North Carolina Coastal Ocean Observing System (NCCOOS) is a local/sub-regional observing system associated with the southeast regional observing system, SEACOOS. One of the primary goals of NCCOOS as it grows is to develop a robust set of Ocean Observing platforms. These include offshore buoys and Navy towers, estuarine profiling platforms, a rooftop development package, and remotely-sensed surface current radar.

The remotely sensed surface current radar system is comprised of two HF Radar units that were deployed on the Outer Banks of North Carolina early in summer 2003. Operation of the CODAR was checked on several occasions, and current data were found to be several days old, apparently because one of the CODAR sites was not working.

Both were Long Range SeaSonde units, manufactured by CODAR Ocean Sensors. Output from two sites produces a map of surface currents that are averaged over a 6-km by 6-km square of ocean, up to 200 km from the shore. These measurements are distributed as three-hour averages at hourly intervals in near-real time.

NCCOOS also measures nearshore currents using an ADCP at Bogue pier. Those data are useful for inshore currents and are not otherwise available (e.g., NOAA).

SAROPS Applicability: The results of the sea surface radar data are useful for SAR operations. Data from sea surface radar can readily be integrated into SAROPS. Reliability and on-site support are relatively low. Potential users need to check with NCCOOS on area coverage. This system has good horizontal resolution. The data quality is typical of HF radar systems. No active checking of accuracy is performed. The availability of technical support may be overstated. This

product provides information on a complex area. It is conditionally recommended for inclusion in the SAROPS EDS.

Product Provider: University of North Carolina, Wilmington (UNCW)

Center / Department / Section: UNCW Center for Marine Science

Product Name: Coastal Ocean Research & Monitoring Program (CORMP) - Observing System

Parameters:	Sea-surface currents	Salinity	
	Sea surface/subsurface temperature	Water level	Wave direction
	Wave max height		

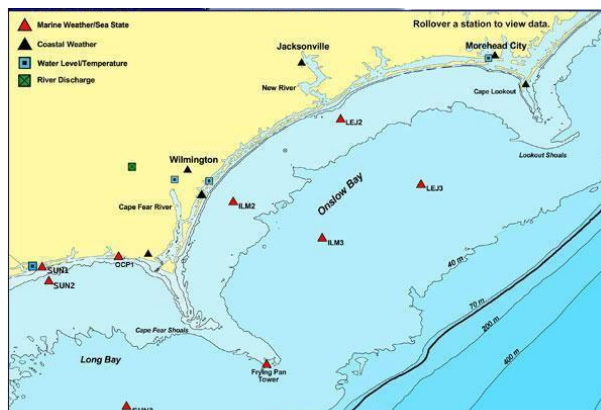
Product Type: Oceanographic Observed

Funding Source: Non-profit

Point of Contact Information:

Coverage: North Carolina

Name: Jennifer Dorton
Phone: 910-962-2777
Email: dortonj@uncw.edu
Web site: <http://www.cormp.org>



Description: CORMP, primarily funded by NOAA, was established in 2000 as a research and monitoring program to address the IOOS goals in the southeastern North Carolina coastal ocean. CORMP currently has two near real-time buoys built by NC State University (ILM2 and ILM3) that update every two hours via Iridium and two NDBC buoys (LEJ2 and LEJ3) that update hourly via Iridium and GOES. All buoys collect basic meteorological data: wind speed, gust and direction, air temp, humidity, barometric pressure, solar radiation and dew point. Latitudes and longitudes of the buoys are available on the CORMP Web site. CORMP also maintains one pier based station in Brunswick County (OCF1) that collects waves, currents, water temperature and basic meteorological data. Mooring locations are noted on the map.

Buoys and pier moorings collect data that include surface and subsurface currents, temperature and winds, salinity and turbidity. Subsurface moorings and other fixed moorings in the Cape Fear River collect river discharge data that are telemetered back to the UNCW Center for Marine Science.

Data are collected and sent to NDBC, and CORMP also provides data to SEACOOS. CORMP works closely with Caro-COOPS, located at University of South Carolina, and both CORMP and Caro-COOPS provide observational data to NC State for modeling purposes.

SAROPS Applicability: These in-situ observations would be a useful source of data for SAR operations in the local nearshore environment. The meteorological data are available from NDBC; however the current data are not. This system provides technical support during working hours only. Observation lag times for the ILM2 and ILM3 buoys and their operational status affect the system's operational score somewhat; however the reliability level of the LEJ2 and

LEJ3 buoys have reportedly improved during the past year. Reported real-time data checking is also good. This product is recommended as a supplemental source of information. This product is conditionally recommended for inclusion in the SAROPS EDS.

Product Provider: University of North Florida (UNF)

Center / Department / Section: Engineering/ Advanced Weather Information Systems Lab

Product Name: HiRes Weather Research and Forecast (WRF) Model

Parameters: Air temperature	Air temperature daily max/min	Area forecast
Atmospheric pressure	Dew point	Precipitation type/rate
Relative humidity	Surface wind speed/gusts	Visibility
Wind stress	Winds at altitude	

Product Type: Atmospheric Modeled

Funding Source: Public

Point of Contact Information:

Coverage: South East U.S. / Florida

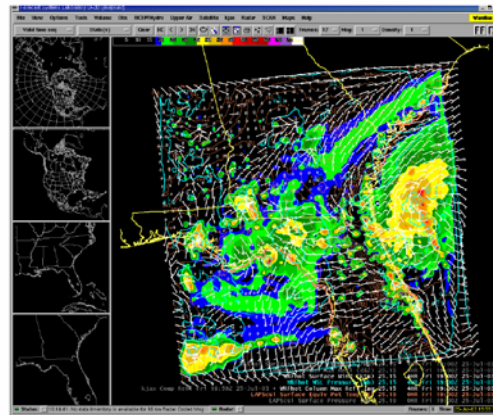
Name: Patrick Welsh

Phone: 904-620-2756

Email: pwelsh@unf.edu

Web site:

http://www.unf.edu/dept/its/flr/weatherinfo_systems.html



Description: Advanced Weather Information Systems Lab is part of the College of Computing and is dedicated to mesoscale data, analysis and atmospheric modeling in the Southeast U.S. Dr. Pat Welsh of the Division of Engineering at UNF and his collaborators in the Advanced Weather Information Systems Laboratory are working on real-time weather information systems, including real-time wireless data collection, assimilation and high-resolution mesoscale atmospheric modeling.

The system uses data from local field sensors (such as the Florida Road Weather Information System) and large gridded global model results from the National Weather Service that are downloaded to initialize the high resolution model. The global model is then blended with added local data, satellite and Doppler radar data to start the high resolution run with the optimum state of the current atmosphere.

These model results using the new Weather Research and Forecast (WRF) model developed by the National Center for Atmospheric Research (NCAR) have been shown to provide much better sea breeze and convective rain results in Florida than previous models, and performed very well for the 2003 and 2004 Hurricane seasons. The goal of this Laboratory data collection and modeling effort is to produce improved and timely data, analysis and forecasting tools to Florida weather forecasters, environmental managers, and other researchers such as hydrologic, coastal ocean and estuary modelers needing better wind and rain inputs to their models.

The system is run daily and the results have been verified through the NOAA Coastal Storms Initiative. The results show much improved winds over ETA, with better convective thunderstorm forecasts. The data products are not yet available electronically (planned), and NetCDF files will be available as well as Web graphics.

SAROPS Applicability: Regional mesoscale models are very useful for assistance in SAR operations. This particular application could be useful as it uses data assimilation and focuses on resolving sea breezes, but is not currently operational. Technical support is available 12 hours per day on workdays only. This product's accessibility was low due to the short online archive data availability. Spatial resolution and time step of the data are very good. Although a nowcast is provided, no model-data checking or uncertainty estimates are provided. This product is not recommended for inclusion in the SAROPS EDS at this time.

Product Provider: University of South Carolina
Center / Department / Section: Marine Science
Product Name: High Frequency Radar Project

Parameters: Sea-surface currents Wave significant height	Wave direction	Wave peak period
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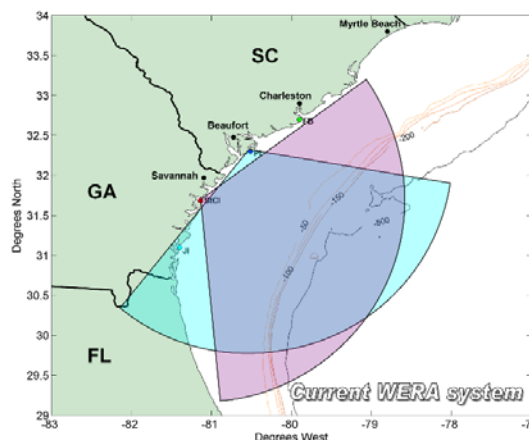
Product Type: Oceanographic Observed

Funding Source: Public

Point of Contact Information:

Name: Richard Styles
Phone: 803-777-4588
Email: rstyles@geol.sc.edu
Web site: <http://www.seacoos.org>

Coverage: South Carolina, Georgia



Description: The Pritchard's Island high frequency Wellen Radar (WERA) project became operational in March 2006. The project is being conducted through the University of South Carolina and Skidaway Oceanographic Institution with a grant from SEACOOS (SouthEast Atlantic Coastal Ocean Observing System). Two WERA systems were installed to provide ocean surface data between Beaufort, SC, and Savannah, GA (<http://sampsit.geol.sc.edu/Research.html>).

The radar system is an 8.35 MHz configuration with long-range coverage out to 200 km so that it reaches the edge of the Gulf Stream. It provides data on a grid spacing of 3 km. Data are collected hourly, and data are represented as 15-minute averaged values.

SAROPS Applicability: This sea surface radar installation provides a broad coverage area for sea-surface currents from the nearshore out to the Gulf Stream. This system is not currently operational, but data from sea surface radar can readily be integrated into SAROPS. The operational status score reflects the future status of the system and is probably higher than the true value. The domain/applicability score is probably lower than the true value. System redundancy is fair. This product is not recommended for inclusion in the SAROPS EDS at this time because the spatial coverage is relatively small and because it does not yet appear to be stable. This area of the coast between northern Florida and North Carolina is poorly characterized, however, and additional coverage of this type is needed.

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Product Provider: University of South Carolina, Baruch Institute

Center / Department / Section: Caro-COOPS, Southeast Atlantic Coastal Ocean Observing System (SEACOOS)

Product Name: Southeast U.S. Atlantic Coastal Ocean Observing System (SEACOOS)
Meteorological Observations

Parameters:	Air temperature	Atmospheric pressure	Relative humidity
	Surface Wind speed/gusts	Visibility	

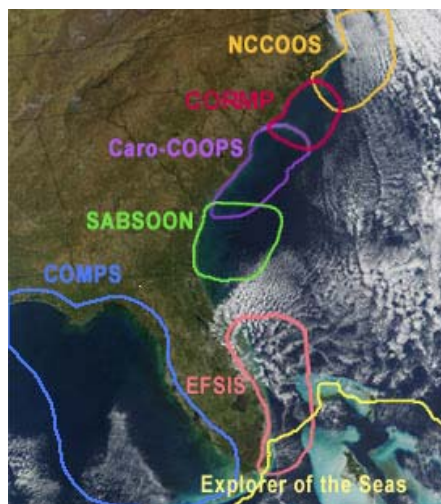
Product Type: Atmospheric Observed

Funding Source: Non-profit

Point of Contact Information:

Coverage: NC, SC, GA, FL

Name: Jeremy Cothran
Phone: 803-777-4469
Email: jcothran@asg.sc.edu
Web site: <http://seacoos.org>



Description: This Web page describes methods for querying SEACOOS data and some of the regularly generated data reports available:

http://nautilus.baruch.sc.edu/twiki_dmcc/bin/view/Main/DataDownload

SEACOOS integrates and displays inputs from its partner organizations: University of North Carolina (NCCOOS), University of South Carolina (CaroCOOPS), University of South Florida (COMPS), Skidaway Institute of Oceanography (SABSOON), and the University of Miami (EFSIS, and Explorer of the Seas), and affiliate: Coastal Ocean Research and Monitoring Program (CORMP).

Data are collected from multiple sources including sea buoys, ships, coastal stations, and airports. Federal sources include NWS, NDBC, NOS, and USGS.

SAROPS Applicability: As the description states, SEACOOS is a RA, and the site integrates data collected by its member organizations. The RAs are valuable in coordinating and planning uses, but data access should be accomplished by other means. The data on this site are available from other sources. Like many of the similar OOS systems, the system is run as a demonstration project.

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Product Provider: University of South Carolina, Baruch Institute

Center / Department / Section: Caro-COOPS, SEACOOS

Product Name: Southeast U.S. Atlantic Coastal Ocean Observing System (SEACOOS)
Oceanographic Observations

Parameters:	Sea-surface currents	Salinity	Sea surface/subsurface temp
	Water level	Wave direction	Wave max height
	Wave peak period	Wave significant height	

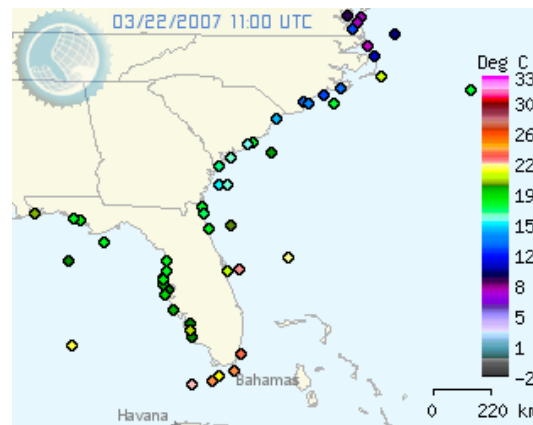
Product Type: Oceanographic Observed

Funding Source: Non-profit

Point of Contact Information:

Coverage: NC, SC, GA, FL

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Product Provider: University of South Carolina, Baruch Institute

Center / Department / Section: Caro-COOPS, SEACOOS

Product Name: Carolinas Coastal Ocean Observing and Prediction System (Caro-COOPS)
Meteorological

Parameters:	Air temperature	Air temperature daily max/min	Atmospheric pressure
	Relative humidity	Surface wind speed/gusts	Visibility

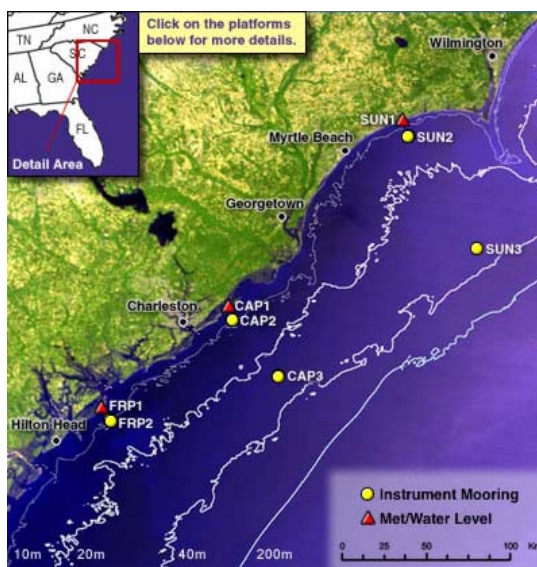
Product Type: Atmospheric Observed

Funding Source: Non-profit

Point of Contact Information:

Coverage: North Carolina, South Carolina

Name: Jeremy Cothran
Phone: 803-777-4469
Email: jcothran@asg.sc.edu
Web site: <http://carocoops.org>



Description: The Carolinas Coastal Ocean Observing and Prediction System (Caro-COOPS) is a cooperative effort of the University of South Carolina, North Carolina State University, and the University of North Carolina at Wilmington. Instruments on coastal and offshore moorings provide oceanographic and meteorological measurements along the coast of the Carolinas. Due to funding constraints, two of the eight buoys have been scheduled for removal.

Caro-COOPS information management system makes information available to public users and to model applications. The Web site describes Caro-COOPS as a pre-operational system of integrated coastal observations. Data are provided with the understanding that they are provisional. Directions for querying and downloading data are available at: http://nautilus.baruch.sc.edu/twiki_carocoops/bin/view/Main/PullCCData.

SAROPS Applicability: Caro-COOPS is a sub-RA, and the site integrates data collected by its members. The data access should be accomplished through a centralized organization, such as NDBC. Like many of the similar observing systems, Caro-COOPS is run as a demonstration project.

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Product Provider: University of South Carolina, Baruch Institute

Center / Department / Section: Caro-COOPS, SEACOOS

Product Name: Carolinas Coastal Ocean Observing and Prediction System (Caro-COOPS)
Oceanographic

Parameters:	Salinity	Sea-surface currents	Sea surface/subsurface temperature
	Water level	Wave direction	Wave peak period
	Wave significant height		

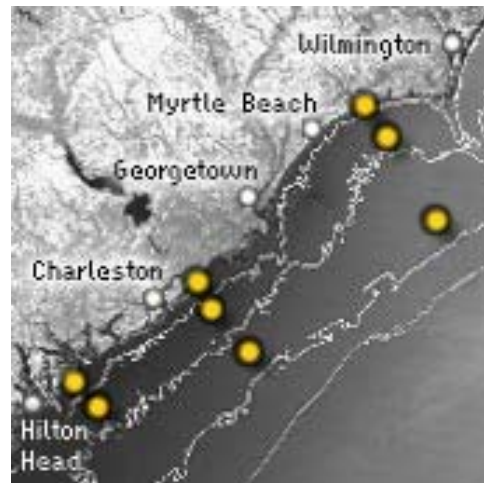
Product Type: Oceanographic Observed

Funding Source: Non-profit

Point of Contact Information:

Coverage: North Carolina, South Carolina

Name: Jeremy Cothran
Phone: Phone: 803-777-4469
Email: jcothran@asg.sc.edu
Web site: <http://carocoops.org>



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SAROPS Applicability: The ADCP data collected by the offshore Caro-COOPS buoys is valuable for SAR use, and their continued operation should be encouraged. Caro-COOPS is a sub-RA, and the site integrates data collected by its members. The data access should be accomplished through a centralized organization, such as NDBC. Like many other observing systems, Caro-COOPS is run as a demonstration project.

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Product Provider: University of South Carolina, Baruch Institute

Center / Department / Section: Caro-COOPS, SEACOOS

Product Name: Carolinas Coast Meteorological

Parameters:	Air temperature	Area forecast	Atmospheric pressure
	Relative humidity	Surface wind speed/gusts	

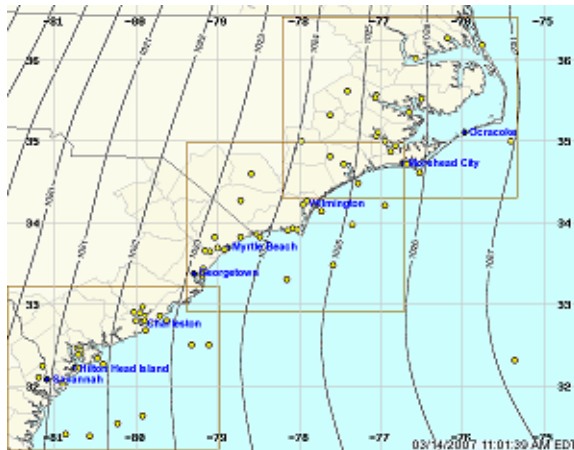
Product Type: Atmospheric Observed

Funding Source: Non-profit

Point of Contact Information:

Coverage: North Carolina, South Carolina

Name: Jeremy Cothran
Phone: 803-777-4469
Email: jcothran@asg.sc.edu
Web site: <http://carocoops.org/carolinas>



Description: This product is a NOAA Web site that combines data provided by the Caro-COOPS and SEACOOS associations with the NOAA NWS and its data and forecast products. The site is experimental in nature.

SAROPS Applicability: The purpose of this Web site is to combines products from other sources. The site is not appropriate for SAROPS use; however the integrated information may be helpful for USCG planners. The system's present weakness is that the providers do not have an operational focus, so the data are not reliably provided. During one R&DC review, most of the sea stations had no data in the last six hours. The Web site acknowledges this with the following warnings "Carolinas Coast is an experimental site that links observations and forecasts from a variety of data providers. Some data may be periodically unreliable. Also pay attention to time stamps on real-time observations. For further information please contact the webmaster."

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Product Provider: University of South Carolina, Baruch Institute

Center / Department / Section: Caro-COOPS, SEACOOS

Product Name: Carolinas Coast Oceanographic

Parameters:	Sea-surface currents	Salinity	Sea surface/subsurface temperature
	Water level	Wave direction	Wave peak period
	Wave significant height		

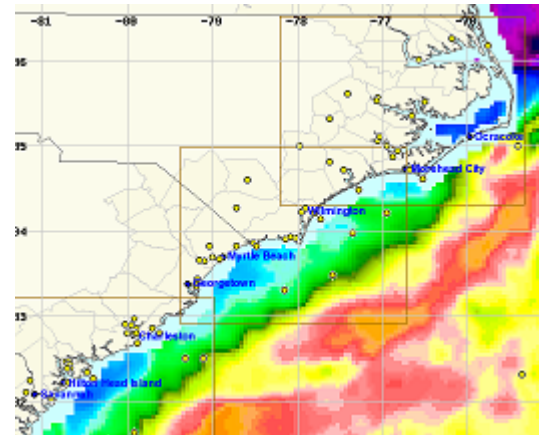
Product Type: Oceanographic Observed

Funding Source: Non-profit

Point of Contact Information:

Coverage: North Carolina, South Carolina

Name: Jeremy Cothran
Phone: 803-777-4469
Email: jcothran@asg.sc.edu
Web site: <http://carocoops.org/carolinas>



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Product Provider: University of South Florida

Center / Department / Section: College of Marine Science

Product Name: Coastal Ocean Monitoring and Prediction System (COMPS)

Parameters:	Sea-surface currents Water level Wave significant height	Salinity Wave direction	Sea surface/subsurface temp Wave peak period
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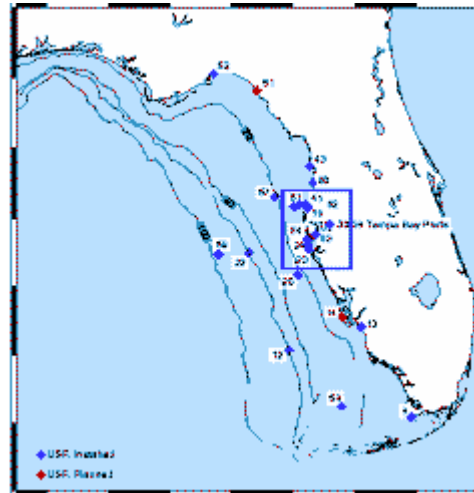
Product Type: Oceanographic Observed

Funding Source: Public

Point of Contact Information:

Coverage: West Florida Shelf

Name: Clifford Merz
Phone: 727-553-3729
Email: cmerz@marine.usf.edu
Web site: <http://comps.marine.usf.edu/>



Description: COMPS is intended to provide information for coastal management, including areas such as coastal flooding predictions, maritime navigation and safety (search and rescue), environmental protection, and fisheries. Real-time measurements of currents, temperature, salinity and atmospheric parameters are obtained from offshore buoys, while additional information on temperature, salinity, water level and meteorological conditions is provided by instrumented coastal towers. A network of observing stations on the West Florida Shelf (WFS) is maintained by USF and its partners; data are available through this Web site.

SAROPS Applicability: The COMPS dataset is useful as a supplemental source for SAR information in this area. The data are available from NDBC. The CODAR data (mentioned separately) should be combined with the point measurements provided by this product. This product is conditionally recommended for inclusion in the SAROPS EDS.

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Product Provider: University of South Florida

Center / Department / Section: Ocean Circulation Group, College of Marine Science

Product Name: Observing System

Parameters: Sea-surface currents

Product Type: Oceanographic Observed

Funding Source: Public

Point of Contact Information:

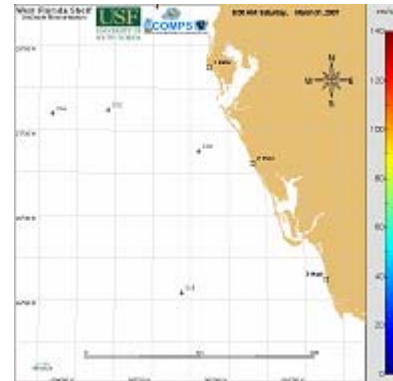
Coverage: West Florida Shelf

Name: Robert Weisberg

Phone: 727-553-1568

Email: weisberg@marine.usf.edu

Web site: <http://ocgweb.marine.usf.edu>



Description: USF operates a set of long range CODARs from stations at Indian Rocks Beach and Naples. USF collaborates with Mote Marine Lab, which operates a station at Venice.

SAROPS Applicability: This system is not operated continuously at present and is not recommended for inclusion in the SAROPS EDS.

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Product Provider: University of South Florida

Center / Department / Section: College of Marine Science

Product Name: West Florida Shelf Model

Parameters:	Sea-surface currents	Salinity	Sea surface/subsurface temperature
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Product Type: Oceanographic Modeled

Funding Source: Public

Point of Contact Information:

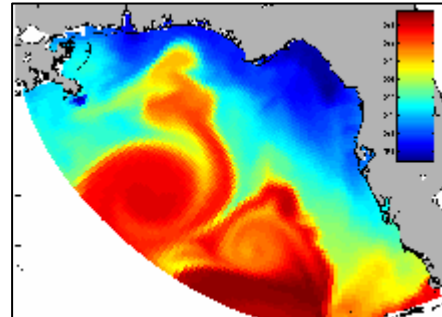
Coverage: West Florida Shelf

Name: Robert Weisberg

Phone: 727-553-1568

Email: weisberg@marine.usf.edu

Web site: <http://ocgmod1.marine.usf.edu/WFS/>



Description: USF has built a coordinated observing and modeling system for the WFS with multidisciplinary applications. Data consists of in-situ observations of water column ocean variables and surface meteorology, HF Radar-derived surface currents, and satellite-derived SST, SSH and geostrophic currents. The models range from a regional WFS circulation model nested in the north Atlantic HYCOM to sub-regional estuary models and models linking the estuaries with the shelf. This information is available at <http://ocgweb.marine.usf.edu>.

The West Florida Shelf (WFS) circulation model provides daily forecasts out to 3.5 days of velocity vectors, velocity components, and drifter trajectories at the surface, mid-depth, and bottom, as well as temperature and salinity. As described on the Web site, the WFS model uses ROMS, a hydrostatic, 3-dimensional, primitive-equation, free-surface model. Resolution near the coast is 4 km, increasing to 10 km near the open boundary. The NCEP and NOGAPS models are used as inputs for atmospheric forcing.

The model without tides provides daily results, while the model with tides (experimental) produces hourly results. The POC describes the WFS circulation model as a carefully constructed circulation modeling tool for use on the west Florida continental shelf. He also states that it has evolved through quantitative comparisons with observations as reported in the refereed literature. Recent testing has included intercomparisons of model-derived trajectories with surface drifters.

SAROPS Applicability: This product is one of only a few real-time model systems identified by the study. It is presently operated as a research tool and would benefit from improved operational support and redundancy. The WFS model would be a useful operational product for the eastern Gulf. This product is recommended for inclusion in the SAROPS EDS.

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Product Provider: University of South Florida - College of Marine Science
Center / Department / Section: Institute for Marine Remote Sensing (IMARS)
Product Name: Observing System

Parameters: Salinity	Sea surface/subsurface temperature	Turbidity
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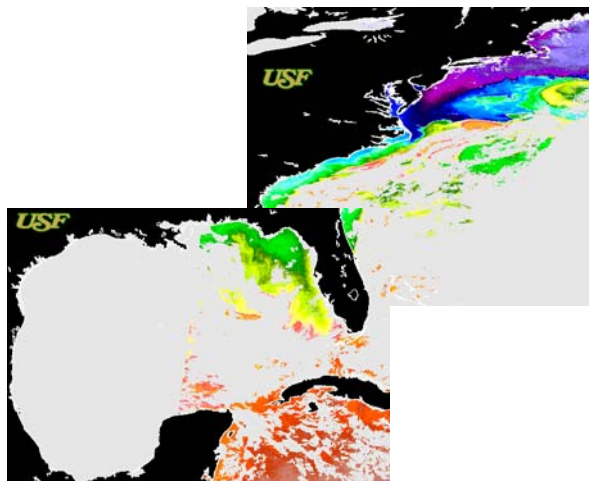
Product Type: Oceanographic Observed

Funding Source: Public

Point of Contact Information:

Coverage: U.S. East Coast, Gulf of Mexico

Name: Frank Muller-Karger
Phone: 727-553-3335
Email: carib@marine.usf.edu
Web site: <http://imars.usf.edu>



Description: IMaRS research activities focus on the analysis of digital data obtained by satellite and airborne sensors, and on the development of applications of these data at local, regional, and global scales. The main objective is to provide a better understanding of the world oceans on a large spatial and temporal scale. In situ optical and biological data are collected for ground truthing and to relate the apparent and inherent optical properties of water constituents with the remote sensors' signal. IMaRS specialize in coastal processes of highly variable regions like the Gulf of Mexico, the Caribbean Sea and Cuba using instruments such as Advanced Very High Resolution Radiometer, Coastal Zone Color Scanner, SeaWiFS, Moderate Resolution Imaging Spectroradiometer, and Landsat. IMaRS uses other sensors such as altimeters and scatterometers to examine the physical environment in the adjacent deep ocean.

The program analyzes data from these sensors on a continuous basis and produces data for SST and ocean color within minutes of receiving the data. Near real-time data are available for the western Atlantic, Gulf of Mexico, Eastern Caribbean, East Coast of the U.S. and the Great Lakes. The data are made available in a variety of formats, swath data, map data in the gridded Hierarchical Data Format, and images.

Sea-surface currents and river discharges (size of plumes) can be visualized from the images, although actual estimates are not provided. Turbidity can be determined from the ocean color data.

SAROPS Applicability: Sea surface temperature and chlorophyll are not high priority parameters for SAR directly, although SST will play a role in survival modeling. This data can be used indirectly as an input for model assimilation and other parameters such as surface

currents can be inferred from the product. The questionnaire response specifies that the product provides surface currents, but the product appears to be based on a visual interpretation of the SST maps and would not be usable for SAROPS. The output format will make the integration of this product into SAROPS relatively straightforward. The system does not have an operational user base, but has apparently operated with high reliability. When last checked, however, the time lag was several days. For the parameters measured, the domain and resolution are very good. The only weakness in the data quality category is the lack of independent sensor calibration checks. This product would be useful as a supplemental data source, but is not recommended for inclusion in the SAROPS EDS.

Product Provider: WeatherFlow Inc.

Center / Department / Section: Weather Networks

Product Name: Mesoscale Atmospheric Model

Parameters: Atmospheric pressure	Air temperature	Air temperature daily max/min
Relative humidity	Summary	Surface wind speed/gusts
Wind stress		

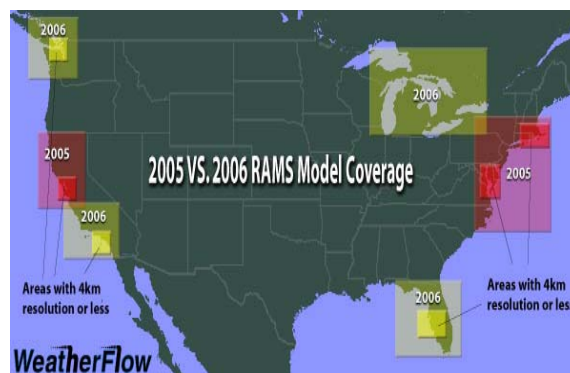
Product Type: Atmospheric Modeled

Funding Source: Private

Point of Contact Information:

Coverage: Coastal U.S. Areas

Name: Jay Titlow
Phone: 757-868-5362
Email: jtitlow@weatherflow.com
Web site: <http://www.weatherflow.com>



Description: WeatherFlow is a private weather company that specializes in delivery of custom weather observations and forecasts to commercial users. Their primary users are surfers, windsurfers, kite surfers, and recreational sailors. This is a discerning client base with high expectations and excellent local knowledge so they are constantly given feedback on the quality of their data products. Their data are also used by regional USCG stations and Department of Defense clients.

The WeatherFlow modeling products consist of multiple RAMS model domains covering CONUS, with resolution from 12 km down to 2 km, and higher resolution in high traffic areas. The map above denotes current grid coverage in red, with 2006 grid expansion noted in yellow. High resolution (4 km and less) model data is available for the following regions: Boston Harbor, Cape Cod Bay, Chesapeake Bay, Narragansett Bay, Nantucket Sound, Long Island Sound, Rhode Island Sound, San Francisco Bay, and Vineyard Sound.

The models are driven by the NCEP NAM (ETA) model at 0000Z and 12000Z. There is approximately a 2–3 hour lag time after initialization for the forecast to be available. The forecast is a 36 hour forecast and is provided at a 10m height. There is currently no Analysis product.

WeatherFlow incorporates a comprehensive QA/QC process at the central data warehouse, with automated email communications on any model errors. The model is very reliable, and runs are completed > 99% on time. This infrastructure is based on a Department of Defense SBIR and is designed to be highly reliable.

Data assimilation may be turned on or off; though it is generally off, but they perform validation exercises and comparisons against observations from their own buoy network as well as NDBC buoys. They are currently working on statistics for uncertainty and error for the models as well as the NWS marine forecasts.

A live archive of model products is currently available for 1–2 weeks, and earlier data may be obtained upon request. Data are available in image format and electronic format based on a commercial agreement with WeatherFlow.

Future developments include exploring Intelligent Initialization that will allow RAMS to be driven by NAM, NOGAPS, GFS, UK MET office products, and ECMWF, on the basis of which is best for the time and region.

SAROPS Applicability: This product represents one of the most advanced commercial modeling products as WeatherFlow combines a large network of sensors with mesoscale meteorological models and a robust data center that meets the needs of “must have” users who are very critical of the results. They also track and publish the performance of the model simulations and have experience delivering data to the USCG. This product rates highly in all areas. This product is recommended for inclusion in the SAROPS EDS.

Product Provider: WeatherFlow Inc.

Center / Department / Section: Weather Networks

Product Name: National Mesonet

Parameters: Air temperature
Surface wind speed/gusts

Atmospheric pressure

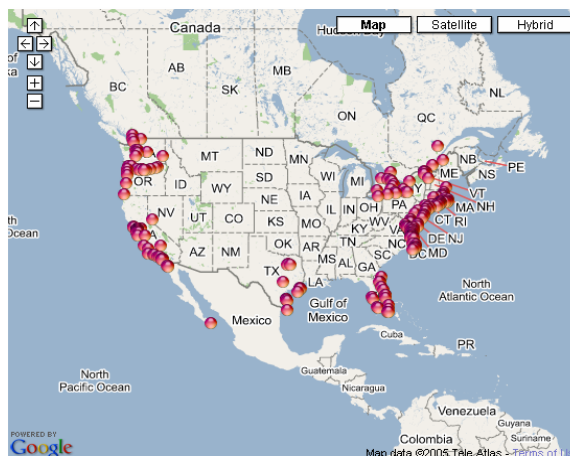
Product Type: Atmospheric Observed

Funding Source: Private

Point of Contact Information:

Name: Jay Titlow
Phone: 757-868-5362
Email: jtitlow@weatherflow.com
Web site: <http://www.weatherflow.com>

Coverage: Coastal U.S. Areas



Description: WeatherFlow is a private weather company that specializes in delivery of custom weather observations and forecasts to commercial users. Their users span a range from the Defense Threat Reduction Agency and the United States' Navy to surfers and recreational sailors. This is a discerning client base with high expectations and excellent local knowledge so they are constantly given feedback on the quality of their data products. Their data are also used by regional USCG stations. The majority of WeatherFlow's sites are located on the open water, with telemetry signal transfer back to shore, often Coast Guard base stations.

WeatherFlow has a national coastal mesonet with a presence in over 20 states, in addition to systems in Japan, New Zealand, and Canada. The primary focus is on collection of data and increasing the understanding of the complex nature of climate within the coastal zone. WeatherFlow's observation program currently manages over 300 weather stations for the continental United States and Hawaii, with a focus on busy, high-traffic coastal areas. The stations collect data on wind conditions, atmospheric pressure, air and in some locations, water temperature. In addition, WeatherFlow is outfitting its first buoy-mounted weather equipment, and well as its first current/wave height sensor in the coming weeks. On average, these stations report 30 times per day to a central data warehouse.

The central data warehouse is accessed via WeatherFlow's Data Center Marine (DCM) portal. The portal provides data from WeatherFlow's private network of stations, other sensors that adhere to WeatherFlow QC standards, as well as National Weather Service (NWS) products. Data delivery is available via ftp push/pull, e-mail alerts, cell phone access, audio phone updates,

as well as an informative Web page that integrates multiple parameters from observation and model data.

They have a comprehensive QA/QC process, with automated email communications on any observation errors or outages. The observation data are also used for calibration of the mesoscale wind models (RAMS) that WeatherFlow runs operationally for different regions.

SAROPS Applicability: This large network of sensors and centralization at a robust data warehouse is very valuable for SAR operations. They have experience delivering data to the USCG and integration with SAROPS would be relatively straightforward. This product meets nearly all of the ideal criteria. Observation data include all values from U.S. government sites, supplemented by WeatherFlow's own network, so coverage is better than NWS. This product is recommended for inclusion in the SAROPS EDS.

Product Provider: Woods Hole Oceanographic Institution (WHOI)

Center / Department / Section: Martha's Vineyard Coastal Observatory (MVCO)

Product Name: Observing System

Parameters: Air temperature daily max/min
Atmospheric pressure
Summary
Wind stress

Air temperature
Relative humidity
Surface wind speed/gusts
Wind turbulent kinetic energy

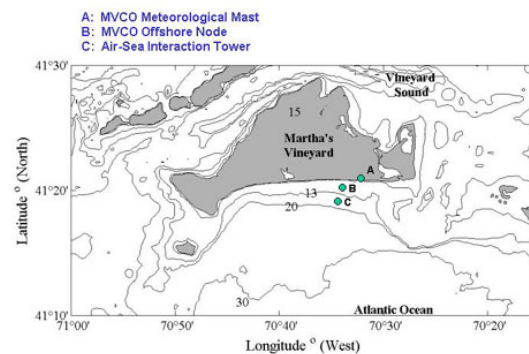
Product Type: Atmospheric Observed

Funding Source: Private

Point of Contact Information:

Name: Janet Fredericks
Phone: 508-289-2573
Email: jfredericks@whoi.edu
Web site: <http://www.whoi.edu/mvco>

Coverage: Martha's Vineyard



Description: The Woods Hole Oceanographic Institution built the Martha's Vineyard Coastal Observatory (MVCO) near South Beach in Edgartown, Massachusetts. The project was initiated by scientists in the Coastal and Ocean Fluid Dynamics Laboratory (COFDL) at WHOI, who will use the observatory to study coastal atmospheric and oceanic processes.

The MVCO includes a small shore lab located between the hangars at Katama Air Park, a 10-m meteorological mast near the South Beach Donnelly House and an air-sea interaction tower (ASIT) equipped with a top-side node to allow access to air-side or underwater instrumentation at the 15-m isobath. The meteorological and oceanographic instrumentation are connected directly to the shore lab via a buried electro-optic power cable. The core set of instruments at the meteorological mast measure wind speed and direction, temperature, humidity, precipitation, CO₂, solar and IR radiation, momentum, heat, and moisture fluxes.

Data from the observatory are downloaded from the shore lab every twenty minutes: 5, 25 & 45 minutes after the hour. They are processed to provide burst-averaged statistics, with the most current data presented on the MVCO home page. Summary files of the meteorological and oceanographic data are provided in the MetDat_s and OcnDat_s files, respectively. Historical burst averaged data can be retrieved via a Web interface or anonymous ftp (<ftp://mvcodata.whoi.edu>).

SAROPS Applicability: This is useful as a single-point, in-situ observation source for the local (Martha's Vineyard) nearshore environment. The data are available in a format

that is readily useable within SAROPS. This system had a research focus, but would be useful, if needed, for SAR support along the southern Martha's Vineyard coast. System operation and focus lower its suitability as a reliable source of information. The MVCO data would be useful if part of a network that could be accessed centrally. This product is not recommended for inclusion in the SAROPS EDS due to its limited spatial coverage.

Product Provider: Woods Hole Oceanographic Institution (WHOI)

Center / Department / Section: Martha's Vineyard Coastal Observatory (MVCO)

Product Name: Martha's Vineyard Coastal Observatory – Oceanographic

Parameters: Salinity	Sea-surface currents
Sea surface/subsurface temperature	Water level
Wave direction	Wave peak period
Wave significant height	

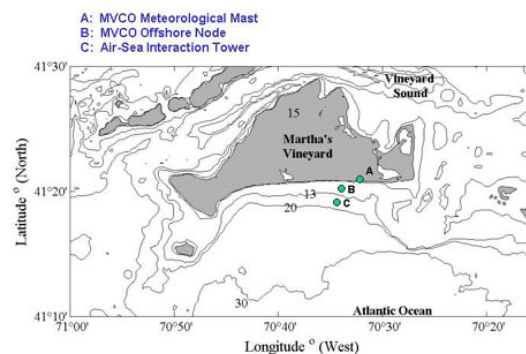
Product Type: Oceanographic Observed

Funding Source: Private

Point of Contact Information:

Coverage: Martha's Vineyard

Name: Janet Fredericks
Phone: 508-289-2573
Email: jfredericks@whoi.edu
Web site: <http://www.whoi.edu/mvco>



Description: The Woods Hole Oceanographic Institution built the Martha's Vineyard Coastal Observatory (MVCO) near South Beach in Edgartown, Massachusetts. The project was initiated by scientists in the Coastal and Ocean Fluid Dynamics Laboratory (COFDL) at WHOI, who will use the observatory to study coastal atmospheric and oceanic processes.

The MVCO includes a small shore lab located between the hangars at Katama Air Park, a 10-m meteorological mast near the South Beach Donnelly House, a subsurface node mounted in 12-m water depth approximately 1.5 km south of Edgartown Great Pond, and an air-sea interaction tower (ASIT) equipped with a top-side node to allow access to air-side or underwater instrumentation at the 15-m isobath. The meteorological and oceanographic instrumentation are connected directly to the shore lab via a buried electro-optical power cable. The core set of instruments at the meteorological mast measure wind speed and direction, temperature, humidity, precipitation, CO₂, solar and IR radiation, momentum, heat, and moisture fluxes. The core oceanographic sensors at the 12-m offshore node measure current profiles, waves, temperature, salinity, and near-bottom wave-orbital and low frequency currents.

Data from the observatory are downloaded from the shore lab every twenty minutes: 5, 25 & 45 minutes after the hour. They are processed to provide burst-averaged statistics, with the most current data presented on the MVCO home page. Summary files of the meteorological and oceanographic data are provided in the MetDat_s and OcnDat_s files, respectively. Historical burst averaged data can be retrieved via a Web interface (JGOFS format) or anonymous ftp (<ftp://mvcodata.whoi.edu>).

SAROPS Applicability: This is useful as a single-point, in-situ observation source for the local (Martha's Vineyard) near-shore environment. The data are available in a format that is readily useable within SAROPS. This system had a research focus, but would be useful, if needed, for SAR support along the southern Martha's Vineyard coast. System operation and focus lower its suitability as a reliable source of information. The MVCO data would be useful if part of a network that could be accessed centrally. This product is not recommended for SAROPS due to its limited spatial coverage.

APPENDIX C. PRODUCT COVERAGE BY DISTRICT

Table C-1. National product list.

Product Type	Provider	Product Name	Page
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USN, FNMOC	Navy Coupled Ocean Data Assimilation (NCODA) - Atmospheric	B-115
	NOAA, NWS	National Digital Forecast Database (NDFD)	B-65
	Oceanweather, Inc.	Global Wind/Wave Analysis and Forecast	B-73
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	Weather Flow, Inc.	National Mesonet	B-203
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
	FSU, COAPS	FSU QSCAT Objective Gridded Winds	B-19
	CALTECH, JPL	QuikSCAT Reduced Merged GDR	B-7
Oceanographic Modeled	NOAA, NOS	Operational Coastal Models	B-51
	USN, FNMOC	Wave Watch 3 - Global	B-111
	USN, FNMOC	Navy Coupled Ocean Data Assimilation (NCODA) - Oceanographic	B-117
	USGS, Water Resources	National Water Information System (NWIS) Surface-Water Data	B-105
	USN, NAVOCEANO	Global Navy Coastal Ocean Model (NCOM)	B-119
	Surflife.com	Models and Buoy Observations	B-93
	ESR	Ocean Surface Current Analyses - Real time (OSCAR)	B-15
Oceanographic Observed	GeoLogics Corporation	GODAE High Resolution Sea Surface Temperature	B-21
	NOAA, NOS	PORTS Surface Current Data	B-53
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
	Johns Hopkins, APL	Sea Surface Temperature	B-27
	NOAA, NESDIS	Advanced High Resolution (AVHRR) Pathfinder Sea Surface Temperature	B-49
	NOAA, NESDIS	Sea Surface Temperature	B-47

Table C-2. District 1 coverage – atmospheric parameters.

Product Type	Provider	Product Name	Page
Wind Speed			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	Weather Flow Inc.	Mesoscale Atmospheric Model	B-201
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	Weather Flow Inc.	National Mesonet	B-203
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
	UMaine, SMS	Gulf of Maine Ocean Observing System (GoMOOS) Buoys	B-155
	NOAA, NOS	CoastWatch Great Lakes Node Meteorological Observations	B-55
	WHOI	Observing System	B-205
Air Temperature			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	Weather Flow Inc.	Mesoscale Atmospheric Model	B-201
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	Weather Flow Inc.	National Mesonet	B-203
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
	UMaine, SMS	Gulf of Maine Ocean Observing System (GoMOOS) Buoys	B-155
	WHOI	Observing System	B-205
Air Temperature Max/Min			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	Weather Flow Inc.	Mesoscale Atmospheric Model	B-201
	NOAA, NWS	National Digital Forecast Database	B-65
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric	NOAA, NESDIS	NDBC Meteorological Buoys	B-43

Table C-2. District 1 coverage – atmospheric parameters (cont.).

Product Type	Provider	Product Name	Page
Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
	WHOI	Observing System	B-205

Table C-2. District 1 coverage – atmospheric parameters (cont.).

Product Type	Provider	Product Name	Page
Area Forecast			
Atmospheric Modeled	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Atmospheric Pressure			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	Weather Flow Inc.	Mesoscale Atmospheric Model	B-201
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	Weather Flow Inc.	National Mesonet	B-203
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
	UMaine, SMS	Gulf of Maine Ocean Observing System (GoMOOS) Buoys	B-155
	WHOI	Observing System	B-205
Ceiling			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Cloud Layers			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39

Table C-2. District 1 coverage – atmospheric parameters (cont.).

Product Type	Provider	Product Name	Page
Dew Point			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale Model (NAM) Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Icing Layer			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Icing Potential			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Precipitation Rate			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39

Table C-2. District 1 coverage – atmospheric parameters (cont.).

Product Type	Provider	Product Name	Page
Relative Humidity			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	Weather Flow Inc.	Mesoscale Atmospheric Model	B-201
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
	WHOI	Observing System	B-205
Summary of Current Meteorological Conditions			
Atmospheric Modeled	Weather Flow Inc.	Mesoscale Atmospheric Model	B-201
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
	UMaine, SMS	Gulf of Maine Ocean Observing System (GoMOOS) Buoys	B-155
	WHOI	Observing System	B-205
Total Cloud Cover			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Visibility			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
	UMaine, SMS	Gulf of Maine Ocean Observing System (GoMOOS) Buoys	B-155

Table C-2. District 1 coverage – atmospheric parameters (cont.).

Product Type	Provider	Product Name	Page
Weather Type			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	NOAA, NWS	National Digital Forecast Database	B-65
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Wind Chill			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Wind Stress			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	Weather Flow Inc.	Mesoscale Atmospheric Model	B-201
Atmospheric Observed	WHOI	Observing System	B-205
Wind Turbulent Kinetic Energy			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
Atmospheric Observed	WHOI	Observing System	B-205
Winds at Altitude			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39

Table C-3. District 1 coverage – oceanographic parameters.

Product Type	Provider	Product Name	Page
Currents			
Oceanographic Modeled	NOAA, NOS	Operational Coastal Models	B-51
	Stevens Institute of Technology, CMS/ Davidson Laboratory	New York Harbor Observation and Prediction System (NYHOPS)	B-89
	USN, NAVOCEANO	Global Navy Coastal Ocean Model (NCOM)	B-119
	NOAA, NWS	Real Time Ocean Forecast System (RTOFS)	B-67
	Mercator-Ocean	Mercator Ocean Forecasts	B-31
	surflne.com	Models and Buoy Observations	B-93
	ASA	Regional Tidal Constituent Models	B-5
	ESR	Ocean Surface Current Analyses - Real time (OSCAR)	B-15
	USN, NRL	HYbrid Coordinate Ocean Model (HYCOM)	B-129
	UMaine, SMS	Ocean Circulation Model	B-153
Oceanographic Observed	Stevens Institute of Technology, CMS/ Davidson Laboratory	New York Harbor Observing System (NYHOS)	B-91
	Rutgers University, ICMS	COOL	B-81
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
	JHU, APL	Sea Surface Temperature	B-27
	UConn, Marine Sciences Department	Long Island Sound Integrated Coastal Observing System (LISICOS)	B-145
	UCSD, Scripps Institution of Oceanography	Near-Real Time Surface Currents	B-137
	UMaine, SMS	Gulf of Maine Ocean Observing System (GoMOOS) Buoys	B-155
	UMaine, SMS	Gulf of Maine Ocean Observing System (GoMOOS) CODAR	B-155
	WHOI	Martha's Vineyard Coastal Observatory - Oceanographic	B-207

Table C-3. District 1 coverage – oceanographic parameters (cont.).

Product Type	Provider	Product Name	Page
Sea Surface Temperature			
Oceanographic Modeled	NOAA, NOS	Operational Coastal Models	B-51
	Stevens Institute of Technology, CMS/ Davidson Laboratory	New York Harbor Observation and Prediction System (NYHOPS)	B-89
	USN, NAVOCEANO	Global Navy Coastal Ocean Model (NCOM)	B-119
	NOAA, NWS	Real Time Ocean Forecast System (RTOFS)	B-67
	Mercator-Ocean	Mercator Ocean Forecasts	B-31
	surflin.com	Models and Buoy Observations	B-93
	USN, NRL	HYbrid Coordinate Ocean Model (HYCOM)	B-129
	UMaine, SMS	Ocean Circulation Model	B-153
Oceanographic Observed	Rutgers University, ICMS	COOL	B-81
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
	JHU, APL	Sea Surface Temperature	B-27
	NOAA, NESDIS	Advanced High Resolution (AVHRR) Pathfinder Sea Surface Temperature	B-49
	UConn, Marine Sciences Department	Long Island Sound Integrated Coastal Observing System (LISICOS)	B-145
	NOAA, NOS	Ocean Observations from NOS/NOAA Port	B-57
	UMaine, SMS	Gulf of Maine Ocean Observing System (GoMOOS) Buoys	B-155
	NOAA, NESDIS	Sea Surface Temperature	B-47
	WHOI	Martha's Vineyard Coastal Observatory - Oceanographic	B-207
	SURA	Interoperability Demonstration Web site	B-85
Ice Cover			
Oceanographic Modeled	Mercator-Ocean	Mercator Ocean Forecasts	B-31
	USN, NRL	HYbrid Coordinate Ocean Model (HYCOM)	B-129
Oceanographic Observed	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	NOAA, NOS	Ocean Observations from NOS/NOAA Port	B-57
Ice Type			
Oceanographic Observed	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	NOAA, NOS	Ocean Observations from NOS/NOAA Port	B-57
River Discharge			
Oceanographic Modeled	Stevens Institute of Technology, CMS/ Davidson Laboratory	New York Harbor Observation and Prediction System (NYHOPS)	B-89
	ASA	Regional Tidal Constituent Models	B-5
Oceanographic Observed	Stevens Institute of Technology, CMS/ Davidson Laboratory	New York Harbor Observing System (NYHOS)	B-91
	JHU, APL	Sea Surface Temperature	B-27

Table C-3. District 1 coverage – oceanographic parameters (cont.).

Product Type	Provider	Product Name	Page
Salinity			
Oceanographic Modeled	NOAA, NOS	Operational Coastal Models	B-51
	Stevens Institute of Technology, CMS/ Davidson Laboratory	New York Harbor Observation and Prediction System (NYHOPS)	B-89
	USN, NAVOCEANO	Global Navy Coastal Ocean Model (NCOM)	B-119
	NOAA, NWS	Real Time Ocean Forecast System (RTOFS)	B-67
	Mercator-Ocean	Mercator Ocean Forecasts	B-31
	surflines.com	Models and Buoy Observations	B-93
	USN, NRL	HYbrid Coordinate Ocean Model (HYCOM)	B-129
	UMaine, SMS	Ocean Circulation Model	B-153
Oceanographic Observed	Stevens Institute of Technology, CMS/ Davidson Laboratory	New York Harbor Observing System (NYHOS)	B-91
	UConn, Marine Sciences Department	Long Island Sound Integrated Coastal Observing System (LISICOS)	B-145
	UMaine, SMS	Gulf of Maine Ocean Observing System (GoMOOS) Buoys	B-155
	WHOI	Martha's Vineyard Coastal Observatory - Oceanographic	B-207
	SURA	Interoperability Demonstration Web site	B-85
Turbidity			
Oceanographic Observed	Stevens Institute of Technology, CMS/ Davidson Laboratory	New York Harbor Observing System (NYHOS)	B-91
Turbulent Dispersion Coefficient			
Oceanographic Modeled	UMaine	Gulf of Maine Ocean Currents Model	B-153
Water Level			
Oceanographic Modeled	NOAA, NOS	Operational Coastal Models	B-51
	Stevens Institute of Technology, CMS/ Davidson Laboratory	New York Harbor Observation and Prediction System (NYHOPS)	B-89
	NOAA, NWS	Real Time Ocean Forecast System (RTOFS)	B-67
	USN, NRL	HYbrid Coordinate Ocean Model (HYCOM)	B-129
	UMaine, SMS	Ocean Circulation Model	B-153
Oceanographic Observed	Stevens Institute of Technology, CMS/ Davidson Laboratory	New York Harbor Observing System (NYHOS)	B-91
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
	NOAA, NOS	Ocean Observations from NOS/NOAA Port	B-57
	WHOI	Martha's Vineyard Coastal Observatory - Oceanographic	B-207
	SURA	Interoperability Demonstration Web site	B-85

Table C-3. District 1 coverage – oceanographic parameters (cont.).

Product Type	Provider	Product Name	Page
Wave Direction			
Oceanographic Modeled	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
	Stevens Institute of Technology, CMS/ Davidson Laboratory	New York Harbor Observation and Prediction System (NYHOPS)	B-89
	Oceanweather, Inc.	Global Wind/Wave Analysis and Forecast	B-73
	surflines.com	Models and Buoy Observations	B-93
Oceanographic Observed	Stevens Institute of Technology, CMS/ Davidson Laboratory	New York Harbor Observing System (NYHOS)	B-91
	Rutgers University, ICMS	COOL	B-81
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	UConn, Marine Sciences Department	Long Island Sound Integrated Coastal Observing System (LISICOS)	B-145
	WHOI	Martha's Vineyard Coastal Observatory - Oceanographic	B-207
Wave Significant Height			
Oceanographic Modeled	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
	Stevens Institute of Technology, CMS/ Davidson Laboratory	New York Harbor Observation and Prediction System (NYHOPS)	B-89
	SURA	Wave Watch 3	B-87
	Oceanweather, Inc.	Global Wind/Wave Analysis and Forecast	B-73
	surflines.com	Models and Buoy Observations	B-93
Oceanographic Observed	Stevens Institute of Technology, CMS/ Davidson Laboratory	New York Harbor Observing System (NYHOS)	B-91
	Rutgers University, ICMS	COOL	B-81
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
	UConn, Marine Sciences Department	Long Island Sound Integrated Coastal Observing System (LISICOS)	B-145
	UMaine, SMS	Gulf of Maine Ocean Observing System (GoMOOS) Buoys	B-155
	WHOI	Martha's Vineyard Coastal Observatory - Oceanographic	B-207
	SURA	Interoperability Demonstration Web site	B-85

Table C-3. District 1 coverage – oceanographic parameters (cont.).

Product Type	Provider	Product Name	Page
Wave Maximum Height			
Oceanographic Modeled	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
	Stevens Institute of Technology, CMS/ Davidson Laboratory	New York Harbor Observation and Prediction System (NYHOPS)	B-89
	SURA	Wave Watch 3	B-87
	Oceanweather, Inc.	Global Wind/Wave Analysis and Forecast	B-73
	surflines.com	Models and Buoy Observations	B-93
Oceanographic Observed	Stevens Institute of Technology, CMS/ Davidson Laboratory	New York Harbor Observing System (NYHOS)	B-91
	Rutgers University, ICMS	COOL	B-81
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	UConn, Marine Sciences Department	Long Island Sound Integrated Coastal Observing System (LISICOS)	B-145
Wave Peak Period			
Oceanographic Modeled	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
	Stevens Institute of Technology, CMS/ Davidson Laboratory	New York Harbor Observation and Prediction System (NYHOPS)	B-89
	SURA	Wave Watch 3	B-87
	Oceanweather, Inc.	Global Wind/Wave Analysis and Forecast	B-73
	surflines.com	Models and Buoy Observations	B-93
Oceanographic Observed	Stevens Institute of Technology, CMS/ Davidson Laboratory	New York Harbor Observing System (NYHOS)	B-91
	Rutgers University, ICMS	COOL	B-81
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
	UConn, Marine Sciences Department	Long Island Sound Integrated Coastal Observing System (LISICOS)	B-145
	WHOI	Martha's Vineyard Coastal Observatory - Oceanographic	B-207
White Cap Probability			
Oceanographic Modeled	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111

Table C-4. District 5 coverage – atmospheric parameters.

Product Type	Provider	Product Name	Page
Wind Speed			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	Weather Flow Inc.	National Mesonet	B-203
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
	UMCES	Observing System	B-161
	NOAA, NOS	CoastWatch Great Lakes Node Meteorological Observations	B-55
	USC, Baruch Institute	Carolinas Coast Meteorological	B-189
	USC, Baruch Institute	Southeast U.S. Atlantic Coastal Ocean Observing System (SEACOOS) Meteorological	B-181
Air Temperature			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	Weather Flow Inc.	National Mesonet	B-203
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
	UMCES	Observing System	B-161
	USC, Baruch Institute	Carolinas Coast Meteorological	B-189
	USC, Baruch Institute	Southeast U.S. Atlantic Coastal Ocean Observing System (SEACOOS) Meteorological	B-181
Air Temperature Max/Min			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39

Table C-4. District 5 coverage – atmospheric parameters (cont.).

Product Type	Provider	Product Name	Page
Area Forecast			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Atmospheric Pressure			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	Weather Flow Inc.	National Mesonet	B-203
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
	USC, Baruch Institute	Carolinas Coast Meteorological	B-189
	USC, Baruch Institute	Southeast U.S. Atlantic Coastal Ocean Observing System (SEACOOS) Meteorological	B-181
Ceiling			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Cloud Layers			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39

Table C-4. District 5 coverage – atmospheric parameters (cont.).

Product Type	Provider	Product Name	Page
Dew Point			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Icing Layer			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Icing Potential			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Precipitation Rate			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39

Table C-4. District 5 coverage – atmospheric parameters (cont.).

Product Type	Provider	Product Name	Page
Relative Humidity			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
	UMCES	Observing System	B-161
	USC, Baruch Institute	Carolinas Coast Meteorological	B-189
	USC, Baruch Institute	Southeast U.S. Atlantic Coastal Ocean Observing System (SEACOOS) Meteorological	B-181
Summary of Current Meteorological Conditions			
Atmospheric Modeled	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Total Cloud Cover			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Visibility			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
	USC, Baruch Institute	Southeast U.S. Atlantic Coastal Ocean Observing System (SEACOOS) Meteorological	B-181

Table C-4. District 5 coverage – atmospheric parameters (cont.).

Product Type	Provider	Product Name	Page
Weather Type			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	NOAA, NWS	National Digital Forecast Database	B-65
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Wind Chill			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Wind Stress			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
Wind Turbulent Kinetic Energy			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
Winds at Altitude			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39

Table C-5. District 5 coverage – oceanographic parameters.

Product Type	Provider	Product Name	Page
Currents			
Oceanographic Modeled	NOAA, NOS	Operational Coastal Models	B-51
	NOAA	Chesapeake Bay Model	B-63
	USN, NAVOCEANO	Global Navy Coastal Ocean Model (NCOM)	B-119
	UNC, Chapel Hill	ADCIRC	B-171
	ESR	Ocean Surface Current Analyses - Real time (OSCAR)	B-15
Oceanographic Observed	Rutgers University	COOL	B-81
	UNCW, CMS	Coastal Ocean Research & Monitoring Program (CORMP) Observing System	B-175
	NOAA	NDBC Oceanographic Buoys	B-45
	UCSD, Scripps	Coastal Observing Research and Development Center (CORDC) Surface Current Data Management System	B-137
	UNC, Chapel Hill	CODAR – Sea Surface Radar Measurements	B-173
Sea Surface Temperature			
Oceanographic Modeled	NOAA, NOS	Operational Coastal Models	B-51
	NOAA, NOS	Chesapeake Bay Model	B-63
	USN, NAVOCEANO	Global Navy Coastal Ocean Model (NCOM)	B-119
	NOAA, NWS	Real Time Ocean Forecast System (RTOFS)	B-67
	Mercator-Ocean	Mercator Ocean Forecasts	B-31
	surflne.com	Models and Buoy Observations	B-93
	USN, NRL	HYbrid Coordinate Ocean Model (HYCOM)	B-129
Oceanographic Observed	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-139
	Rutgers University, ICMS	COOL	B-81
	UNCW, CMS	Coastal Ocean Research & Monitoring Program (CORMP) Observing System	B-175
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
	College of William and Mary, VIMS	Observing System	B-13
	JHU, APL	Sea Surface Temperature	B-27
	NOAA, NESDIS	Advanced High Resolution (AVHRR) Pathfinder Sea Surface Temperature	B-49
	SECOORA	North Carolina Coastal Ocean Observing System (NCCOOS)	B-83
	NOAA, NOS	Ocean Observations from NOS/NOAA Port	B-57
	NOAA, NESDIS	Sea Surface Temperature	B-47
	UD, CMES	Delaware Bay Observing System (DBOS)	B-149
	SURA	Interoperability Demonstration Web site	B-85
	USC, Baruch Institute	Carolinas Coast Oceanographic	B-191
	USC, Baruch Institute	Southeast U.S. Atlantic Coastal Ocean Observing System (SEACOOS) Oceanographic	B-183
	UMCES	Observing System	B-161

Table C-5. District 5 coverage – oceanographic parameters (cont.).

Product Type	Provider	Product Name	Page
Ice Cover			
Oceanographic Modeled	Mercator-Ocean	Mercator Ocean Forecasts	B-31
	USN, NRL	HYbrid Coordinate Ocean Model (HYCOM)	B-129
Oceanographic Observed	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	NOAA, NOS	Ocean Observations from NOS/NOAA Port	B-57
Ice Type			
Oceanographic Observed	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	NOAA, NOS	Ocean Observations from NOS/NOAA Port	B-57
River Discharge			
Oceanographic Modeled	NOAA, NOS	Chesapeake Bay Model	B-63
	ASA	Regional Tidal Constituent Models	B-5
Oceanographic Observed	JHU, APL	Sea Surface Temperature	B-27
Salinity			
Oceanographic Modeled	NOAA, NOS	Operational Coastal Models	B-51
	NOAA, NOS	Chesapeake Bay Model	B-63
	USN, NAVOCEANO	Global Navy Coastal Ocean Model (NCOM)	B-119
	NOAA, NWS	Real Time Ocean Forecast System (RTOFS)	B-67
	Mercator-Ocean	Mercator Ocean Forecasts	B-31
	surflines.com	Models and Buoy Observations	B-93
	USN, NRL	HYbrid Coordinate Ocean Model (HYCOM)	B-129
Oceanographic Observed	UNCW, CMS	Coastal Ocean Research & Monitoring Program (CORMP) Observing System	B-175
	College of William and Mary, VIMS	Observing System	B-13
	SECOORA	North Carolina Coastal Ocean Observing System (NCCOOS)	B-83
	UD, CMES	Delaware Bay Observing System (DBOS)	B-149
	USC, Baruch Institute	Southeast U.S. Atlantic Coastal Ocean Observing System (SEACOOS) Oceanographic	B-183
	USC, Baruch Institute	Carolinas Coast Oceanographic	B-191
	SURA	Interoperability Demonstration Web site	B-85
	UMCES	Observing System	B-161
Turbulent Dispersion Coefficient			
Oceanographic Modeled	NOAA, NOS	Chesapeake Bay Model	B-63

Table C-5. District 5 coverage – oceanographic parameters (cont.).

Product Type	Provider	Product Name	Page
Water Level			
Oceanographic Modeled	NOAA, NOS	Operational Coastal Models	B-51
	NOAA, NOS	Chesapeake Bay Model	B-63
	NOAA, NWS	Real Time Ocean Forecast System (RTOFS)	B-67
	USN, NRL	HYbrid Coordinate Ocean Model (HYCOM)	B-129
Oceanographic Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	UNCW, CMS	Coastal Ocean Research & Monitoring Program (CORMP) Observing System	B-175
	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
	College of William and Mary, VIMS	Observing System	B-13
	SECOORA	North Carolina Coastal Ocean Observing System (NCCOOS)	B-83
	NOAA, NOS	Ocean Observations from NOS/NOAA Port	B-57
	USC, Baruch Institute	Carolinas Coast Oceanographic	B-191
	USC, Baruch Institute	Southeast U.S. Atlantic Coastal Ocean Observing System (SEACOOS) Oceanographic	B-183
	SURA	Interoperability Demonstration Web site	B-85
Wave Direction			
Oceanographic Modeled	UCSD, Scripps	CDIP Wave Models	B-141
	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
	Oceanweather, Inc.	Global Wind/Wave Analysis and Forecast	B-73
	surflines.com	Models and Buoy Observations	B-93
Oceanographic Observed	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-139
	Rutgers University, ICMS	COOL	B-81
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	UNCW, CMS	Coastal Ocean Research & Monitoring Program (CORMP) Observing System	B-175
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	College of William and Mary, VIMS	Observing System	B-13
	SECOORA	North Carolina Coastal Ocean Observing System (NCCOOS)	B-83
	UD, CMES	Delaware Bay Observing System (DBOS)	B-149
	USC, Baruch Institute	Carolinas Coast Oceanographic	B-191
	USC, Baruch Institute	Southeast U.S. Atlantic Coastal Ocean Observing System (SEACOOS) Oceanographic	B-183
	UMCES	Observing System	B-161

Table C-5. District 5 coverage – oceanographic parameters (cont.).

Product Type	Provider	Product Name	Page
Wave Significant Height			
Oceanographic Modeled	UCSD, Scripps	CDIP Wave Models	B-141
	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
	SURA	Wave Watch 3	B-87
	Oceanweather, Inc.	Global Wind/Wave Analysis and Forecast	B-73
	surflne.com	Models and Buoy Observations	B-93
Oceanographic Observed	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-139
	Rutgers University, ICMS	COOL	B-81
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
	College of William and Mary, VIMS	Observing System	B-13
	SECOORA	North Carolina Coastal Ocean Observing System (NCCOOS)	B-83
	USC, Baruch Institute	Carolinas Coast Oceanographic	B-191
	USC, Baruch Institute	Southeast U.S. Atlantic Coastal Ocean Observing System (SEACOOS) Oceanographic	B-183
	SURA	Interoperability Demonstration Web site	B-85
	UMCES	Observing System	B-161
Wave Maximum Height			
Oceanographic Modeled	UCSD, Scripps Institution of Oceanography	CDIP Wave Models	B-141
	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
	SURA	Wave Watch 3	B-87
	Oceanweather, Inc.	Global Wind/Wave Analysis and Forecast	B-73
	surflne.com	Models and Buoy Observations	B-93
Oceanographic Observed	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-139
	Rutgers University, ICMS	COOL	B-81
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	UNCW, CMS	Coastal Ocean Research & Monitoring Program (CORMP) Observing System	B-175
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	College of William and Mary, VIMS	Observing System	B-13
	SECOORA	North Carolina Coastal Ocean Observing System (NCCOOS)	B-83
	USC, Baruch Institute	Southeast U.S. Atlantic Coastal Ocean Observing System (SEACOOS) Oceanographic	B-183
	UMCES	Observing System	B-161

Table C-5. District 5 coverage – oceanographic parameters (cont.).

Product Type	Provider	Product Name	Page
Wave Peak Period			
Oceanographic Modeled	UCSD, Scripps Institution of Oceanography	CDIP Wave Models	B-141
	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
	SURA	Wave Watch 3	B-87
	Oceanweather, Inc.	Global Wind/Wave Analysis and Forecast	B-73
	surflne.com	Models and Buoy Observations	B-93
Oceanographic Observed	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-139
	Rutgers University, ICMS	COOL	B-81
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
	College of William and Mary, VIMS	Observing System	B-13
	SECOORA	North Carolina Coastal Ocean Observing System (NCCOOS)	B-83
	USC, Baruch Institute	Carolinas Coast Oceanographic	B-191
	USC, Baruch Institute	Southeast U.S. Atlantic Coastal Ocean Observing System (SEACOOS) Oceanographic	B-183
	UMCES	Observing System	B-161
White Cap Probability			
Oceanographic Modeled	UCSD, Scripps Institution of Oceanography	CDIP Wave Models	B-141
	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
Oceanographic Observed	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-139
	UD, CMES	Delaware Bay Observing System (DBOS)	B-149

Table C-6. District 7 coverage – atmospheric parameters.

Product Type	Provider	Product Name	Page
Wind Speed			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	Weather Flow Inc.	Mesoscale Atmospheric Model	B-201
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	Weather Flow Inc.	National Mesonet	B-203
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
	FSU, COAPS	FSU QuikSCAT Objective Gridded Winds	B-19
	NOAA, NOS	CoastWatch Great Lakes Node Meteorological Observations	B-55
	USC, Baruch Institute	Carolinas Coast Meteorological	B-189
	USC, Baruch Institute	Southeast U.S. Atlantic Coastal Ocean Observing System (SEACOOS) Meteorological	B-181
	USC, Baruch Institute	Carolinas Coastal Ocean Observing and Prediction System (Caro-COOPS) Meteorological	B-185
Air Temperature			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	Weather Flow Inc.	Mesoscale Atmospheric Model	B-201
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	Weather Flow Inc.	National Mesonet	B-203
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
	USC, Baruch Institute	Carolinas Coast Meteorological	B-189
	USC, Baruch Institute	Carolinas Coastal Ocean Observing and Prediction System (Caro-COOPS) Meteorological	B-185
	USC, Baruch Institute	Southeast U.S. Atlantic Coastal Ocean Observing System (SEACOOS) Meteorological	B-181

Table C-6. District 7 coverage – atmospheric parameters (cont.).

Product Type	Provider	Product Name	Page
Air Temperature Max/Min			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	Weather Flow Inc.	Mesoscale Atmospheric Model	B-201
	NOAA, NWS	National Digital Forecast Database	B-65
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
	USC, Baruch Institute	Carolinas Coastal Ocean Observing and Prediction System (Caro-COOPS) Meteorological	B-185
Area Forecast			
Atmospheric Modeled	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
	USC, Baruch Institute	Carolinas Coast Meteorological	B-189
Atmospheric Pressure			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	Weather Flow Inc.	Mesoscale Atmospheric Model	B-201
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	Weather Flow Inc.	National Mesonet	B-203
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
	USC, Baruch Institute	Carolinas Coast Meteorological	B-189
	USC, Baruch Institute	Carolinas Coastal Ocean Observing and Prediction System (Caro-COOPS) Meteorological	B-185
	USC, Baruch Institute	Southeast U.S. Atlantic Coastal Ocean Observing System (SEACOOS) Meteorological	B-181
Ceiling			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39

Table C-6. District 7 coverage – atmospheric parameters (cont.).

Product Type	Provider	Product Name	Page
Cloud Layers			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Dew Point			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Icing Layer			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Icing Potential			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39

Table C-6. District 7 coverage – atmospheric parameters (cont.).

Product Type	Provider	Product Name	Page
Precipitation Rate			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Relative Humidity			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	Weather Flow Inc.	Mesoscale Atmospheric Model	B-201
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
	USC, Baruch Institute	Carolinas Coast Meteorological	B-189
	USC, Baruch Institute	Carolinas Coastal Ocean Observing and Prediction System (Caro-COOPS) Meteorological	B-185
	USC, Baruch Institute	Southeast U.S. Atlantic Coastal Ocean Observing System (SEACOOS) Meteorological	B-181
Summary of Meteorological Conditions			
Atmospheric Modeled	Weather Flow Inc.	Mesoscale Atmospheric Model	B-201
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Total Cloud Cover			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39

Table C-6. District 7 coverage – atmospheric parameters (cont.).

Product Type	Provider	Product Name	Page
Visibility			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
	USC, Baruch Institute	Carolinas Coastal Ocean Observing and Prediction System (Caro-COOPS) Meteorological	B-185
	USC, Baruch Institute	Southeast U.S. Atlantic Coastal Ocean Observing System (SEACOOS) Meteorological	B-181
Weather Type			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	NOAA, NWS	National Digital Forecast Database	B-65
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Wind Chill			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Wind Stress			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	Weather Flow Inc.	Mesoscale Atmospheric Model	B-201
Atmospheric Observed	FSU, COAPS	FSU QuikSCAT Objective Gridded Winds	B-19
Wind Turbulent Kinetic Energy			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107

Table C-6. District 7 coverage – atmospheric parameters (cont.).

Product Type	Provider	Product Name	Page
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
Winds at Altitude			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39

Table C-7. District 7 coverage – oceanographic parameters.

Product Type	Provider	Product Name	Page
Currents			
Oceanographic Modeled	NOAA, NOS	Operational Coastal Models	B-51
	USN, NAVOCEANO	Global Navy Coastal Ocean Model (NCOM)	B-119
	UM, RSMAS	East Florida Shelf Information System (EFSIS)	B-16
	NOAA, NWS	Real Time Ocean Forecast System (RTOFS)	B-67
	Mercator-Ocean	Mercator Ocean Forecasts	B-31
	surflin.com	Models and Buoy Observations	B-93
	USN, NRL	Intra-Americas Sea Ocean Nowcast/Forecast System (IASNFS)	B-127
	USF, College of Marine Science	West Florida Shelf (WFS) Circulation Model	B-197
	ESR	Ocean Surface Current Analyses - Real time (OSCAR)	B-15
	USN, NRL	HYbrid Coordinate Ocean Model (HYCOM)	B-129
Oceanographic Observed	UM, RSMAS	Eastern Florida Gulf HF Radar	B-165
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
	JHU, APL	Sea Surface Temperature	B-27
	UCSD, Scripps Institution of Oceanography	Near-Real Time Surface Currents	B-137
	USF, College of Marine Science	Coastal Ocean Monitoring and Prediction System (COMPS)	B-193
	Horizon Marine, Inc.	Eddy Watch – Observing System	B-23
	USF, College of Marine Science	Observing System	B-195
	UGA, SkIO	South Atlantic Bight Synoptic Offshore Observational Network (SABSOON) Observing System	B-151
	FIT, DMES	Observing System	B-17
	USC, Baruch Institute	Carolinas Coast Oceanographic	B-191
	USC, Baruch Institute	Carolinas Coastal Ocean Observing and Prediction System (Caro-COOPS) Oceanographic	B-187
	USC, Baruch Institute	Southeast U.S. Atlantic Coastal Ocean Observing System (SEACOOS) Oceanographic	B-183

Table C-7. District 7 coverage – oceanographic parameters (cont.).

Product Type	Provider	Product Name	Page
Sea Surface Temperature			
Oceanographic Modeled	NOAA, NOS	Operational Coastal Models	B-51
	USN, NAVOCEANO	Global Navy Coastal Ocean Model (NCOM)	B-119
	UM, RSMAS	East Florida Shelf Information System (EFSIS)	B-167
	NOAA, NWS	Real Time Ocean Forecast System (RTOFS)	B-67
	Mercator-Ocean	Mercator Ocean Forecasts	B-31
	surflne.com	Models and Buoy Observations	B-93
	USN, NRL	Intra-Americas Sea Ocean Nowcast/Forecast System (IASNFS)	B-127
	USF, College of Marine Science	West Florida Shelf (WFS) Circulation Model	B-197
	USN, NRL	HYbrid Coordinate Ocean Model (HYCOM)	B-129
Oceanographic Observed	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-139
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
	JHU, APL	Sea Surface Temperature	B-27
	NOAA, NESDIS	Advanced High Resolution (AVHRR) Pathfinder Sea Surface Temperature	B-49
	NOAA, NOS	Ocean Observations from NOS/NOAA Port	B-57
	USF, College of Marine Science	Coastal Ocean Monitoring and Prediction System (COMPS)	B-193
	NOAA, NESDIS	Sea Surface Temperature	B-47
	USF, College of Marine Science	Observing System	B-195
	UGA, SkIO	South Atlantic Bight Synoptic Offshore Observational Network (SABSOON) Observing System	B-151
	FIT, DMES	Observing System	B-17
	USC, Baruch Institute	Carolinas Coast Oceanographic	B-191
	USC, Baruch Institute	Southeast U.S. Atlantic Coastal Ocean Observing System (SEACOOS) Oceanographic	B-183
	USC, Baruch Institute	Carolinas Coastal Ocean Observing and Prediction System (Caro-COOPS) Oceanographic	B-187
	SURA	Interoperability Demonstration Web site	B-85

Table C-7. District 7 coverage – oceanographic parameters (cont.).

Product Type	Provider	Product Name	Page
Salinity			
Oceanographic Modeled	NOAA, NOS	Operational Coastal Models	B-51
	USN, NAVOCEANO	Global Navy Coastal Ocean Model (NCOM)	B-119
	UM, RSMAS	East Florida Shelf Information System (EFSIS)	B-167
	NOAA, NWS	Real Time Ocean Forecast System (RTOFS)	B-67
	Mercator-Ocean	Mercator Ocean Forecasts	B-31
	surflin.com	Models and Buoy Observations	B-93
	USN, NRL	Intra-Americas Sea Ocean Nowcast/Forecast System (IASNFS)	B-127
	USF, College of Marine Science	West Florida Shelf (WFS) Circulation Model	B-197
	USN, NRL	HYbrid Coordinate Ocean Model (HYCOM)	B-129
Oceanographic Observed	USF, College of Marine Science	Coastal Ocean Monitoring and Prediction System (COMPS)	B-193
	USF, College of Marine Science	Observing System	B-195
	UGA, SkIO	South Atlantic Bight Synoptic Offshore Observational Network (SABSOON) Observing System	B-151
	USC, Baruch Institute	Carolinas Coast Oceanographic	B-191
	USC, Baruch Institute	Carolinas Coastal Ocean Observing and Prediction System (Caro-COOPS) Oceanographic	B-187
	USC, Baruch Institute	Southeast U.S. Atlantic Coastal Ocean Observing System (SEACOOS) Oceanographic	B-183
	SURA	Interoperability Demonstration Web site	B-85
Turbulent Dispersion Coefficient			
Oceanographic Modeled	UM, RSMAS	East Florida Shelf Information System (EFSIS)	B-169
Turbulent Kinetic Energy			
Oceanographic Modeled	UM, RSMAS	East Florida Shelf Information System (EFSIS)	B-169
	Mercator-Ocean	Mercator Ocean Forecasts	B-31
Turbulent Velocity Variance			
Oceanographic Modeled	UM, RSMAS	East Florida Shelf Information System (EFSIS)	B-169

Table C-7. District 7 coverage – oceanographic parameters (cont.).

Product Type	Provider	Product Name	Page
Water Level			
Oceanographic Modeled	NOAA, NOS	Operational Coastal Models	B-51
	UM, RSMAS	East Florida Shelf Information System (EFSIS)	B-167
	NOAA, NWS	Real Time Ocean Forecast System (RTOFS)	B-67
	USN, NRL	Intra-Americas Sea Ocean Nowcast/Forecast System (IASNFS)	B-127
Oceanographic Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
	NOAA, NOS	Ocean Observations from NOS/NOAA Port	B-57
	USF, College of Marine Science	Coastal Ocean Monitoring and Prediction System (COMPS)	B-193
	USF, College of Marine Science	Observing System	B-195
	UGA, SkIO	South Atlantic Bight Synoptic Offshore Observational Network (SABSOON) Observing System	B-151
	FIT, DMES	Observing System	B-17
	USC, Baruch Institute	Carolinas Coast Oceanographic	B-191
	USC, Baruch Institute	Carolinas Coastal Ocean Observing and Prediction System (Caro-COOPS) Oceanographic	B-187
	USC, Baruch Institute	Southeast U.S. Atlantic Coastal Ocean Observing System (SEACOOS) Oceanographic	B-183
	SURA	Interoperability Demonstration Web site	B-85
	USC, Baruch Institute	Carolinas Coastal Ocean Observing and Prediction System (Caro-COOPS) Oceanographic	B-187
Wave Direction			
Oceanographic Modeled	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-141
	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
	Oceanweather, Inc.	Global Wind/Wave Analysis and Forecast	B-73
	surflines.com	Models and Buoy Observations	B-93
Oceanographic Observed	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-139
	USF, College of Marine Science	Coastal Ocean Modeling and Prediction System (COMPS)	B-193
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	USC	Observing System	B-179
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	FIT, DMES	Observing System	B-17
	USC, Baruch Institute	Carolinas Coast Oceanographic	B-191
	USC, Baruch Institute	Carolinas Coastal Ocean Observing and Prediction System (Caro-COOPS) Oceanographic	B-187
	USC, Baruch Institute	Southeast U.S. Atlantic Coastal Ocean Observing System (SEACOOS) Oceanographic	B-183

Table C-7. District 7 coverage – oceanographic parameters (cont.).

Product Type	Provider	Product Name	Page
Wave Significant Height			
Oceanographic Modeled	UCSD, Scripps Institution of Oceanography	CDIP Wave Models	B-141
	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
	SURA	Wave Watch 3	B-87
	Oceanweather, Inc.	Global Wind/Wave Analysis and Forecast	B-73
	surflines.com	Models and Buoy Observations	B-93
Oceanographic Observed	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-139
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	USC	Observing System	
	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
	USF, College of Marine Science	Coastal Ocean Modeling and Prediction System (COMPS)	B-193
	FIT, DMES	Observing System	B-17
	USC, Baruch Institute	Carolinas Coast Oceanographic	B-191
	USC, Baruch Institute	Carolinas Coastal Ocean Observing and Prediction System (Caro-COOPS) Oceanographic	B-187
	USC, Baruch Institute	Southeast U.S. Atlantic Coastal Ocean Observing System (SEACOOS) Oceanographic	B-183
	SURA	Interoperability Demonstration Web site	B-85
Wave Maximum Height			
Oceanographic Modeled	UCSD, Scripps Institution of Oceanography	CDIP Wave Models	B-141
	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
	SURA	Wave Watch 3	B-87
	Oceanweather, Inc.	Global Wind/Wave Analysis and Forecast	B-73
	surflines.com	Models and Buoy Observations	B-93
Oceanographic Observed	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-139
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	UGA, SkIO	South Atlantic Bight Synoptic Offshore Observational Network (SABSOON) Observing System	B-151
	USC, Baruch Institute	Southeast U.S. Atlantic Coastal Ocean Observing System (SEACOOS) Oceanographic	B-183

Table C-7. District 7 coverage – oceanographic parameters (cont.).

Product Type	Provider	Product Name	Page
Wave Peak Period			
Oceanographic Modeled	USC, Baruch Institute	Carolinas Coast Oceanographic	B-191
	UCSD, Scripps Institution of Oceanography	CDIP Wave Models	B-141
	USN, FNMOC	Wave Watch 3 – Regional	B-113
	USN, FNMOC	Wave Watch 3 – Global	B-111
	SURA	Wave Watch 3	B-87
	Oceanweather	Global Wind/Wave Analysis and Forecast	B-73
	Surflin.com	Models and Buoy Observations	B-93
Oceanographic Observed	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-139
	USC	Observing System	B-179
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
	USF, College of Marine Sciences	Coastal Ocean Modeling and Prediction System (COMPS)	B-193
	UGA, SkIO	South Atlantic Bight Synoptic Offshore Observational Network (SABOON) Observing System	B-151
	FIT, DMES	Observing System	B-17
	USC, Baruch Institute	Carolinas Coast Oceanographic	B-191
	USC, Baruch Institute	Carolinas Coastal Ocean Observing and Prediction System (Caro-COOPS) Oceanographic	B-187
	USC, Baruch Institute	Southeast U.S. Atlantic Coastal Ocean Observing System (SEACOOS) Oceanographic	B-183
White Cap Probability			
Oceanographic Modeled	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-139
	USC	Observing System	B-179
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
Oceanographic Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43

Table C-8. District 8 coverage – atmospheric parameters.

Product Type	Provider	Product Name	Page
Wind Speed			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	Weather Flow Inc.	National Mesonet	B-203
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
	NOAA, NOS	CoastWatch Great Lakes Node Meteorological Observations	B-55
	Texas A&M University, Department of Oceanography	GCOOS	B-95
Air Temperature			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	Weather Flow Inc.	National Mesonet	B-203
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
	Texas A&M University, Department of Oceanography	GCOOS	B-95
Ceiling			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39

Table C-8. District 8 coverage – atmospheric parameters (cont.).

Product Type	Provider	Product Name	Page
Cloud Layer			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Dew Point			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Icing Layer			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Icing Potential			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39

Table C-8. District 8 coverage – atmospheric parameters (cont.).

Product Type	Provider	Product Name	Page
Precipitation Rate			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Relative Humidity			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Summary of Meteorological Conditions			
Atmospheric Modeled	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Total Cloud Cover			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39

Table C-8. District 8 coverage – atmospheric parameters (cont.).

Product Type	Provider	Product Name	Page
Visibility			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Weather Type			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	NOAA, NWS	National Digital Forecast Database	B-65
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Wind Chill			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Wind Stress			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
Wind Turbulent Kinetic Energy			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
Winds at Altitude			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69

Table C-8. District 8 coverage – atmospheric parameters (cont.).

Product Type	Provider	Product Name	Page
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39

Table C-9. District 8 coverage – oceanographic parameters.

Product Type	Provider	Product Name	Page
Currents			
Oceanographic Modeled	NOAA, NOS	Operational Coastal Models	B-51
	USN, NAVOCEANO	Global Navy Coastal Ocean Model (NCOM)	B-119
	NOAA, NWS	Real Time Ocean Forecast System (RTOFS)	B-67
	Mercator-Ocean	Mercator Ocean Forecasts	B-31
	surflines.com	Models and Buoy Observations	B-93
	USN, NRL	Intra-Americas Sea Ocean Nowcast/Forecast System (IASNFS)	B-127
	USF, College of Marine Science	West Florida Shelf (WFS) Circulation Model	B-197
	ESR	Ocean Surface Current Analyses - Real time (OSCAR)	B-15
	USN, NRL	HYbrid Coordinate Ocean Model (HYCOM)	B-129
Oceanographic Observed	Texas A&M University-CC, CBI	Texas Coastal Ocean Observation System	B-99
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
	JHU, APL	Sea Surface Temperature	B-27
	Texas GLO	Texas Automated Buoy System	B-101
	UCSD, Scripps Institution of Oceanography	Near-Real Time Surface Currents	B-137
	LSU, CSI	Wave-Current-Surge Information System (WAVCIS)	B-29
	Horizon Marine, Inc.	Eddy Watch – Observing System	B-23
	USF, College of Marine Science	Observing System	B-195

Table C-9. District 8 coverage – oceanographic parameters (cont.).

Product Type	Provider	Product Name	Page
Sea Surface Temperature			
Oceanographic Modeled	NOAA, NOS	Operational Coastal Models	B-51
	USN, NAVOCEANO	Global Navy Coastal Ocean Model (NCOM)	B-119
	NOAA, NWS	Real Time Ocean Forecast System (RTOFS)	B-67
	Mercator-Ocean	Mercator Ocean Forecasts	B-31
	surflines.com	Models and Buoy Observations	B-93
	USN, NRL	Intra-Americas Sea Ocean Nowcast/Forecast System (IASNFS)	B-127
	USF, College of Marine Science	West Florida Shelf (WFS) Circulation Model	B-197
	USN, NRL	HYbrid Coordinate Ocean Model (HYCOM)	B-129
Oceanographic Observed	Texas A&M University-CC, CBI	Texas Coastal Ocean Observation System	B-99
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
	JHU, APL	Sea Surface Temperature	B-27
	Texas GLO	Texas Automated Buoy System	B-101
	NOAA, NESDIS	Advanced High Resolution (AVHRR) Pathfinder Sea Surface Temperature	B-49
	LSU, CSI	Wave-Current-Surge Information System (WAVCIS)	B-29
	NOAA, NOS	Ocean Observations from NOS/NOAA Port	B-57
	NOAA, NESDIS	Sea Surface Temperature	B-47
	USF, College of Marine Science	Observing System	B-195
	SURA	Interoperability Demonstration Web site	B-85
Salinity			
Oceanographic Modeled	NOAA, NOS	Operational Coastal Models	B-51
	USN, NAVOCEANO	Global Navy Coastal Ocean Model (NCOM)	B-119
	NOAA, NWS	Real Time Ocean Forecast System (RTOFS)	B-67
	Mercator-Ocean	Mercator Ocean Forecasts	B-31
	surflines.com	Models and Buoy Observations	B-93
	USN, NRL	Intra-Americas Sea Ocean Nowcast/Forecast System (IASNFS)	B-127
	USF, College of Marine Science	West Florida Shelf (WFS) Circulation Model	B-197
	USN, NRL	HYbrid Coordinate Ocean Model (HYCOM)	B-129
Oceanographic Observed	Texas A&M University-CC, CBI	Texas Coastal Ocean Observation System	B-99
	Texas GLO	Texas Automated Buoy System	B-101
	LSU, CSI	Wave-Current-Surge Information System (WAVCIS)	B-29
	USF, College of Marine Science	Observing System	B-195
	SURA	Interoperability Demonstration Web site	B-85

Table C-9. District 8 coverage – oceanographic parameters (cont.).

Product Type	Provider	Product Name	Page
Turbidity			
Oceanographic Observed	LSU, CSI	Wave-Current-Surge Information System (WAVCIS)	B-29
Water Level			
Oceanographic Modeled	NOAA, NOS	Operational Coastal Models	B-51
	NOAA, NWS	Real Time Ocean Forecast System (RTOFS)	B-67
	USN, NRL	Intra-Americas Sea Ocean Nowcast/Forecast System (IASNFS)	B-127
	USN, NRL	HYbrid Coordinate Ocean Model (HYCOM)	B-129
Oceanographic Observed	Texas A&M University-CC, CBI	Texas Coastal Ocean Observation System	B-99
	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	LSU, CSI	Wave-Current-Surge Information System (WAVCIS)	B-29
	NOAA, NOS	Ocean Observations from NOS/NOAA Port	B-57
	USF, College of Marine Science	Observing System	B-195
	SURA	Interoperability Demonstration Web site	B-85
Wave Direction			
Oceanographic Modeled	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
	Oceanweather, Inc.	Global Wind/Wave Analysis and Forecast	B-73
	surflines.com	Models and Buoy Observations	B-93
Oceanographic Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	LSU, CSI	Wave-Current-Surge Information System (WAVCIS)	B-29
Wave Significant Height			
Oceanographic Modeled	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
	Oceanweather, Inc.	Global Wind/Wave Analysis and Forecast	B-73
	SURA	Wave Watch 3	B-87
	surflines.com	Models and Buoy Observations	B-93
Oceanographic Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
	LSU, CSI	Wave-Current-Surge Information System (WAVCIS)	B-29
	SURA	Interoperability Demonstration Web site	B-85

Table C-9. District 8 coverage – oceanographic parameters (cont.).

Product Type	Provider	Product Name	Page
Wave Maximum Height			
Oceanographic Modeled	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
	SURA	Wave Watch 3	B-87
	Oceanweather, Inc.	Global Wind/Wave Analysis and Forecast	B-73
	surflines.com	Models and Buoy Observations	B-93
Oceanographic Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	LSU, CSI	Wave-Current-Surge Information System (WAVCIS)	B-29
Wave Peak Period			
Oceanographic Modeled	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
	SURA	Wave Watch 3	B-87
	Oceanweather, Inc.	Global Wind/Wave Analysis and Forecast	B-73
	surflines.com	Models and Buoy Observations	B-93
Oceanographic Observed	LSU, CSI	Wave-Current-Surge Information System (WAVCIS)	B-29
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
White Cap Probability			
Oceanographic Modeled	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111

Table C-10. District 9 coverage – atmospheric parameters.

Product Type	Provider	Product Name	Page
Wind Speed			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	Weather Flow Inc.	Mesoscale Atmospheric Model	B-201
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	Weather Flow Inc.	National Mesonet	B-203
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
	NOAA, NOS	CoastWatch Great Lakes Node Meteorological Observations	B-55
Air Temperature			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	Weather Flow Inc.	Mesoscale Atmospheric Model	B-201
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	Weather Flow Inc.	National Mesonet	B-203
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Air Temperature Max/Min			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	Weather Flow Inc.	Mesoscale Atmospheric Model	B-201
	NOAA, NWS	National Digital Forecast Database	B-65
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Area Forecast			
Atmospheric Modeled	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39

Table C-10. District 9 coverage – atmospheric parameters (cont.).

Product Type	Provider	Product Name	Page
Atmospheric Pressure			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	Weather Flow Inc.	Mesoscale Atmospheric Model	B-201
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	Weather Flow Inc.	National Mesonet	B-203
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Ceiling			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Cloud Layers			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Dew Point			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39

Table C-10. District 9 coverage – atmospheric parameters (cont.).

Product Type	Provider	Product Name	Page
Icing Layer			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Icing Potential			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Precipitation Rate			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Relative Humidity			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	Weather Flow Inc.	Mesoscale Atmospheric Model	B-201
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39

Table C-10. District 9 coverage – atmospheric parameters (cont.).

Product Type	Provider	Product Name	Page
Summary of Current Meteorological Conditions			
Atmospheric Modeled	Weather Flow Inc.	Mesoscale Atmospheric Model	B-201
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Total Cloud Cover			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Visibility			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Weather Type			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	NOAA, NWS	National Digital Forecast Database	B-65
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Wind Chill			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39

Table C-10. District 9 coverage – atmospheric parameters (cont.).

Product Type	Provider	Product Name	Page
Wind Stress			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	Weather Flow Inc.	Mesoscale Atmospheric Model	B-201
Wind Turbulent Kinetic Energy			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
Winds at Altitude			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39

Table C-11. District 9 coverage – oceanographic parameters.

Product Type	Provider	Product Name	Page
Currents			
Oceanographic Modeled	NOAA, NOS	Operational Coastal Models	B-51
	USN, NAVOCEANO	Global Navy Coastal Ocean Model (NCOM)	B-119
	surflines.com	Models and Buoy Observations	B-93
	ESR	Ocean Surface Current Analyses - Real time (OSCAR)	B-15
Oceanographic Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
	JHU, APL	Sea Surface Temperature	B-27
	UCSD, Scripps Institution of Oceanography	Near Real-Time Surface Currents - CA	B-137
	UCSD, Scripps Institute	CORDC	B-135
Sea Surface Temperature			
Oceanographic Modeled	NOAA, NOS	Operational Coastal Models	B-51
	USN, NAVOCEANO	Global Navy Coastal Ocean Model (NCOM)	B-119
	surflines.com	Models and Buoy Observations	B-93
Oceanographic Observed	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-139
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	JHU, APL	Sea Surface Temperature	B-27
	NOAA, NESDIS	Advanced High Resolution (AVHRR) Pathfinder Sea Surface Temperature	B-49
	NOAA, NOS	Ocean Observations from NOS/NOAA Port	B-57
	NOAA, NESDIS	Sea Surface Temperature	B-47
Ice Cover			
Oceanographic Observed	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	NOAA, NOS	Ocean Observations from NOS/NOAA Port	B-57
Ice Thickness			
Oceanographic Observed	NOAA, NOS	Ocean Observations from NOS/NOAA Port	B-57
Ice Type			
Oceanographic Observed	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	NOAA, NOS	Ocean Observations from NOS/NOAA Port	B-57
Salinity			
Oceanographic Modeled	NOAA, NOS	Operational Coastal Models	B-51
	USN, NAVOCEANO	Global Navy Coastal Ocean Model (NCOM)	B-119
	surflines.com	Models and Buoy Observations	B-93

Table C-11. District 9 coverage – oceanographic parameters (cont.).

Product Type	Provider	Product Name	Page
Water Level			
Oceanographic Modeled	NOAA, NOS	Operational Coastal Models	B-51
Oceanographic Observed	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NOS	Ocean Observations from NOS/NOAA Port	B-57
Wave Direction			
Oceanographic Modeled	UCSD, Scripps Institution of Oceanography	CDIP Wave Models	B-141
	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
	Oceanweather, Inc.	Global Wind/Wave Analysis and Forecast	B-73
	surflines.com	Models and Buoy Observations	B-93
Oceanographic Observed	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-139
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
Wave Significant Height			
Oceanographic Modeled	UCSD, Scripps Institution of Oceanography	CDIP Wave Models	B-141
	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
	Oceanweather, Inc.	Global Wind/Wave Analysis and Forecast	B-73
	surflines.com	Models and Buoy Observations	B-93
Oceanographic Observed	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-139
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
Wave Maximum Height			
Oceanographic Modeled	UCSD, Scripps Institution of Oceanography	CDIP Wave Models	B-141
	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
	Oceanweather, Inc.	Global Wind/Wave Analysis and Forecast	B-73
	surflines.com	Models and Buoy Observations	B-93
Oceanographic Observed	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-139
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41

Table C-11. District 9 coverage – oceanographic parameters (cont.).

Product Type	Provider	Product Name	Page
Wave Peak Period			
Oceanographic Modeled	UCSD, Scripps Institution of Oceanography	CDIP Wave Models	B-141
	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
	Oceanweather, Inc.	Global Wind/Wave Analysis and Forecast	B-73
	surflines.com	Models and Buoy Observations	B-93
Oceanographic Observed	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-139
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
White Cap Probability			
Oceanographic Modeled	UCSD, Scripps Institution of Oceanography	CDIP Wave Models	B-141
	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
Oceanographic Observed	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-139

Table C-12. District 11 coverage – atmospheric parameters.

Product Type	Provider	Product Name	Page
Wind Speed			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	Weather Flow Inc.	Mesoscale Atmospheric Model	B-201
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	USN, NPS	Center for Integrated Marine Technologies (CIMT) Real-time Wind Product - Model	B-121
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
	CALTECH, JPL	Ocean Wind	B-11
Atmospheric Observed	Weather Flow Inc.	National Mesonet	B-203
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
	USN, NPS	Center for Integrated Marine Technologies (CIMT) Real-time Wind Product - Data	B-123
	NOAA, NOS	CoastWatch Great Lakes Node Meteorological Observations	B-55
Air Temperature			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	Weather Flow Inc.	Mesoscale Atmospheric Model	B-201
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
	CALTECH, JPL	Ocean Wind	B-11
Atmospheric Observed	Weather Flow Inc.	National Mesonet	B-203
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39

Table C-12. District 11 coverage – atmospheric parameters (cont.).

Product Type	Provider	Product Name	Page
Air Temperature Max/Min			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	Weather Flow Inc.	Mesoscale Atmospheric Model	B-201
	NOAA, NWS	National Digital Forecast Database	B-65
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
	CALTECH, JPL	Ocean Wind	B-11
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Area Forecast			
Atmospheric Modeled	USN, NPS	Center for Integrated Marine Technologies (CIMA) Real-time Wind Product - Model	B-121
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
	CALTECH, JPL	Ocean Wind	B-11
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
	USN, NPS	Center for Integrated Marine Technologies (CIMA) Real-time Wind Product - Data	B-123
Atmospheric Pressure			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	Weather Flow Inc.	Mesoscale Atmospheric Model	B-201
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
	CALTECH, JPL	Ocean Wind	B-11
Atmospheric Observed	Weather Flow Inc.	National Mesonet	B-203
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Ceiling			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39

Table C-12. District 11 coverage – atmospheric parameters (cont.).

Product Type	Provider	Product Name	Page
Cloud Layers			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Dew Point			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Icing Layer			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Icing Potential			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39

Table C-12. District 11 coverage – atmospheric parameters (cont.).

Product Type	Provider	Product Name	Page
Precipitation Rate			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
	CALTECH, JPL	Ocean Wind	
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Relative Humidity			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	Weather Flow Inc.	Mesoscale Atmospheric Model	B-201
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
	CALTECH, JPL	Ocean Wind	B-11
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Summary of Current Meteorological Conditions			
Atmospheric Modeled	Weather Flow Inc.	Mesoscale Atmospheric Model	B-201
	USN, NPS	Center for Integrated Marine Technologies (CIMT) Real-time Wind Product - Model	B-121
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
	CALTECH, JPL	Ocean Wind	B-11
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
	USN, NPS	Center for Integrated Marine Technologies (CIMT) Real-time Wind Product - Data	B-123

Table C-12. District 11 coverage – atmospheric parameters (cont.).

Product Type	Provider	Product Name	Page
Total Cloud Cover			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Visibility			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Weather Type			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	NOAA, NWS	National Digital Forecast Database	B-65
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Wind Chill			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39

Table C-12. District 11 coverage – atmospheric parameters (cont.).

Product Type	Provider	Product Name	Page
Wind Stress			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	Weather Flow Inc.	Mesoscale Atmospheric Model	B-201
	CALTECH, JPL	Ocean Wind	B-11
Wind Turbulent Kinetic Energy			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
Winds at Altitude			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39

Table C-13. District 11 coverage – oceanographic parameters.

Product Type	Provider	Product Name	Page
Currents			
Oceanographic Modeled	NOAA, NOS	Operational Coastal Models	B-51
	USN, NAVOCEANO	Global Navy Coastal Ocean Model (NCOM)	B-119
	Mercator-Ocean	Mercator Ocean Forecasts	B-31
	surflne.com	Models and Buoy Observations	B-93
	ASA	Regional Tidal Constituent Models	B-5
	ESR	Ocean Surface Current Analyses - Real time (OSCAR)	B-15
	CALTECH, JPL	Ocean Surface Current	B-9
	USN, NRL	HYbrid Coordinate Ocean Model (HYCOM)	B-129
Oceanographic Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	OSU, COAS	Surface Current Maps	B-79
	UC Davis, BML	Bodega Ocean Observing Node (BOON)	B-133
	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
	UCSB, MSI	Observing System	B-143
	JHU, APL	Sea Surface Temperature	B-27
	UCSD, Scripps Institution of Oceanography	Near-Real Time Surface Currents - CA	B-137
	USN, NPS	Central and Northern California Ocean Observing System (CeNCCOOS), Coastal Ocean Currents Monitoring Program (COCMP)	B-125
Oceanographic Observed	UCSD, Scripps Institution of Oceanography	Near-Real Time Surface Currents - CORDC	B-135
Sea Surface Temperature			
Oceanographic Modeled	NOAA, NOS	Operational Coastal Models	B-51
	USN, NAVOCEANO	Global Navy Coastal Ocean Model (NCOM)	B-119
	Mercator-Ocean	Mercator Ocean Forecasts	B-31
	surflne.com	Models and Buoy Observations	B-93
	CALTECH, JPL	Ocean Surface Current	B-9
	USN, NRL	HYbrid Coordinate Ocean Model (HYCOM)	B-129
Oceanographic Observed	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-139
	UC Davis, BML	Bodega Ocean Observing Node (BOON)	B-133
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	JHU, APL	Sea Surface Temperature	B-27
	NOAA, NESDIS	Advanced High Resolution (AVHRR) Pathfinder Sea Surface Temperature	B-49
	NOAA, NOS	Ocean Observations from NOS/NOAA Port	B-57
	NOAA, NESDIS	Sea Surface Temperature	B-47

Table C-13. District 11 coverage – oceanographic parameters (cont.).

Product Type	Provider	Product Name	Page
Ice Cover			
Oceanographic Modeled	Mercator-Ocean	Mercator Ocean Forecasts	B-31
	USN, NRL	HYbrid Coordinate Ocean Model (HYCOM)	B-129
Oceanographic Observed	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	NOAA, NOS	Ocean Observations from NOS/NOAA Port	B-57
Ice Type			
Oceanographic Observed	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	NOAA, NOS	Ocean Observations from NOS/NOAA Port	B-57
Salinity			
Oceanographic Modeled	NOAA, NOS	Operational Coastal Models	B-51
	USN, NAVOCEANO	Global Navy Coastal Ocean Model (NCOM)	B-119
	Mercator-Ocean	Mercator Ocean Forecasts	B-31
	surflines.com	Models and Buoy Observations	B-93
	CALTECH, JPL	Ocean Surface Current	B-9
	USN, NRL	HYbrid Coordinate Ocean Model (HYCOM)	B-129
Oceanographic Observed	UC Davis, BML	Bodega Ocean Observing Node (BOON)	B-133
Water Level			
Oceanographic Modeled	NOAA, NOS	Operational Coastal Models	B-51
	CALTECH, JPL	Ocean Surface Current	B-9
	USN, NRL	HYbrid Coordinate Ocean Model (HYCOM)	B-129
Oceanographic Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	UC Davis, BML	Bodega Ocean Observing Node (BOON)	B-133
	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
	NOAA, NOS	Ocean Observations from NOS/NOAA Port	B-57
Wave Direction			
Oceanographic Modeled	UCSD, Scripps Institution of Oceanography	CDIP Wave Models	B-141
	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
	Oceanweather, Inc.	Global Wind/Wave Analysis and Forecast	B-73
	surflines.com	Models and Buoy Observations	B-93
Oceanographic Observed	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-139
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41

Table C-13. District 11 coverage – oceanographic parameters (cont.).

Product Type	Provider	Product Name	Page
Wave Significant Height			
Oceanographic Modeled	UCSD, Scripps Institution of Oceanography	Wave Models	B-141
	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
	Oceanweather, Inc.	Global Wind/Wave Analysis and Forecast	B-73
	surflines.com	Models and Buoy Observations	B-93
Oceanographic Observed	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-139
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
Wave Maximum Height			
Oceanographic Modeled	UCSD, Scripps Institution of Oceanography	CDIP Wave Models	B-141
	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
	Oceanweather, Inc.	Global Wind/Wave Analysis and Forecast	B-73
	surflines.com	Models and Buoy Observations	B-93
Oceanographic Observed	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-139
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
Wave Peak Period			
Oceanographic Modeled	UCSD, Scripps Institution of Oceanography	CDIP Wave Models	B-141
	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
	Oceanweather, Inc.	Global Wind/Wave Analysis and Forecast	B-73
	surflines.com	Models and Buoy Observations	B-93
Oceanographic Observed	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-139
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45

Table C-13. District 11 coverage – oceanographic parameters (cont.).

Product Type	Provider	Product Name	Page
White Cap Probability			
Oceanographic Modeled	UCSD, Scripps Institution of Oceanography	CDIP Wave Models	B-141
	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
Oceanographic Observed	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-139

Table C-14. District 13 coverage – atmospheric parameters.

Product Type	Provider	Product Name	Page
Wind Speed			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	Weather Flow Inc.	Mesoscale Atmospheric Model	B-201
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
	CALTECH, JPL	Ocean Wind	B-11
Atmospheric Observed	Weather Flow Inc.	National Mesonet	B-203
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
	NOAA, NOS	CoastWatch Great Lakes Node Meteorological Observations	B-55
Air Temperature			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	Weather Flow Inc.	Mesoscale Atmospheric Model	B-201
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
	CALTECH, JPL	Ocean Wind	B-11
Atmospheric Observed	Weather Flow Inc.	National Mesonet	B-203
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Air Temperature Max/Min			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	Weather Flow Inc.	Mesoscale Atmospheric Model	B-201
	NOAA, NWS	National Digital Forecast Database	B-65
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
	CALTECH, JPL	Ocean Wind	B-11
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39

Table C-14. District 13 coverage – atmospheric parameters (cont.).

Product Type	Provider	Product Name	Page
Area Forecast			
Atmospheric Modeled	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
	CALTECH, JPL	Ocean Wind	B-11
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Atmospheric Pressure			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	Weather Flow Inc.	Mesoscale Atmospheric Model	B-201
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
	CALTECH, JPL	Ocean Wind	B-11
Atmospheric Observed	Weather Flow Inc.	National Mesonet	B-203
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Ceiling			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Cloud Layers			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39

Table C-14. District 13 coverage – atmospheric parameters (cont.).

Product Type	Provider	Product Name	Page
Dew Point			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Icing Layer			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Icing Potential			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Precipitation Rate			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
	CALTECH, JPL	Ocean Wind	B-11
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39

Table C-14. District 13 coverage – atmospheric parameters (cont.).

Product Type	Provider	Product Name	Page
Relative Humidity			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	Weather Flow Inc.	Mesoscale Atmospheric Model	B-201
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
	CALTECH, JPL	Ocean Wind	B-11
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Summary of Current Meteorological Conditions			
Atmospheric Modeled	Weather Flow Inc.	Mesoscale Atmospheric Model	B-201
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
	CALTECH, JPL	Ocean Wind	B-11
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Total Cloud Cover			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Visibility			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39

Table C-14. District 13 coverage – atmospheric parameters (cont.).

Product Type	Provider	Product Name	Page
Weather Type			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	NOAA, NWS	National Digital Forecast Database	B-65
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Wind Chill			
Atmospheric Modeled	NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Wind Stress			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	Weather Flow Inc.	Mesoscale Atmospheric Model	B-201
	CALTECH, JPL	Ocean Wind	B-11
Wind Turbulent Kinetic Energy			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
Winds at Altitude			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39

Table C-15. District 13 coverage – oceanographic parameters.

Product Type	Provider	Product Name	Page
Currents			
Oceanographic Modeled	NOAA, NOS	Operational Coastal Models	B-51
	USN, NAVOCEANO	Global Navy Coastal Ocean Model (NCOM)	B-119
	Mercator-Ocean	Mercator Ocean Forecasts	B-31
	surflne.com	Models and Buoy Observations	B-93
	ASA	Regional Tidal Constituent Models	B-5
	ESR	Ocean Surface Current Analyses - Real time (OSCAR)	B-15
	CALTECH, JPL	Ocean Surface Current	B-9
	USN, NRL	HYbrid Coordinate Ocean Model (HYCOM)	B-129
	OHSU, CCALMR	CORIE Models	B-75
Oceanographic Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	OSU, COAS	Surface Current Maps	B-79
	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
	JHU, APL	Sea Surface Temperature	B-27
	UCSD, Scripps Institution of Oceanography	Near-Real Time Surface Currents	B-137
	UCSD, Scripps Institution of Oceanography	Near-Real Time Surface Currents - CA	B-137
	OHSU, CCALMR	CORIE Observations	B-77
	NANOOS	NANOOS	B-71
Sea Surface Temperature			
Oceanographic Modeled	NOAA, NOS	Operational Coastal Models	B-51
	USN, NAVOCEANO	Global Navy Coastal Ocean Model (NCOM)	B-119
	Mercator-Ocean	Mercator Ocean Forecasts	B-31
	surflne.com	Models and Buoy Observations	B-93
	CALTECH, JPL	Ocean Surface Current	B-9
	USN, NRL	HYbrid Coordinate Ocean Model (HYCOM)	B-129
	OHSU, CCALMR	CORIE Models	B-75
Oceanographic Observed	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-139
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
	JHU, APL	Sea Surface Temperature	B-27
	NOAA, NESDIS	Advanced High Resolution (AVHRR) Pathfinder Sea Surface Temperature	B-49
	NOAA, NOS	Ocean Observations from NOS/NOAA Port	B-57
	NOAA, NESDIS	Sea Surface Temperature	B-47
	OHSU, CCALMR	CORIE Observations	B-77
	NANOOS	NANOOS	B-71

Table C-15. District 13 coverage – oceanographic parameters (cont.).

Product Type	Provider	Product Name	Page
Salinity			
Oceanographic Modeled	NOAA, NOS	Operational Coastal Models	B-51
	USN, NAVOCEANO	Global Navy Coastal Ocean Model (NCOM)	B-119
	Mercator-Ocean	Mercator Ocean Forecasts	B-31
	surflin.com	Models and Buoy Observations	B-93
	CALTECH, JPL	Ocean Surface Current	B-9
	USN, NRL	HYbrid Coordinate Ocean Model (HYCOM)	B-129
	OHSU, CCALMR	CORIE Models	B-75
Oceanographic Observed	OHSU, CCALMR	CORIE Observations	B-77
	NANOOS	NANOOS	B-71
Water Level			
Oceanographic Modeled	NOAA, NOS	Operational Coastal Models	B-51
	CALTECH, JPL	Ocean Surface Current	B-9
	USN, NRL	HYbrid Coordinate Ocean Model (HYCOM)	B-129
	OHSU, CCALMR	CORIE Models	B-75
Oceanographic Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
	NOAA, NOS	Ocean Observations from NOS/NOAA Port	B-57
	OHSU, CCALMR	CORIE Observations	B-77
Wave Direction			
Oceanographic Modeled	UCSD, Scripps Institution of Oceanography	CDIP Wave Models	B-141
	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
	Oceanweather, Inc.	Global Wind/Wave Analysis and Forecast	B-73
	surflin.com	Models and Buoy Observations	B-93
Oceanographic Observed	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-139
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NANOOS	NANOOS	B-71

Table C-15. District 13 coverage – oceanographic parameters (cont.).

Product Type	Provider	Product Name	Page
Wave Significant Height			
Oceanographic Modeled	UCSD, Scripps Institution of Oceanography	CDIP Wave Models	B-141
	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
	Oceanweather, Inc.	Global Wind/Wave Analysis and Forecast	B-73
	surflines.com	Models and Buoy Observations	B-93
Oceanographic Observed	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-139
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
Wave Maximum Height			
Oceanographic Modeled	UCSD, Scripps Institution of Oceanography	CDIP Wave Models	B-141
	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
	Oceanweather, Inc.	Global Wind/Wave Analysis and Forecast	B-73
	surflines.com	Models and Buoy Observations	B-93
Oceanographic Observed	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-139
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
Wave Peak Period			
Oceanographic Modeled	UCSD, Scripps Institution of Oceanography	CDIP Wave Models	B-141
	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
	Oceanweather, Inc.	Global Wind/Wave Analysis and Forecast	B-73
	surflines.com	Models and Buoy Observations	B-93
Oceanographic Observed	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-139
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43

Table C-15. District 13 coverage – oceanographic parameters (cont.).

Product Type	Provider	Product Name	Page
White Cap Probability			
Oceanographic Modeled	UCSD, Scripps Institution of Oceanography	CDIP Wave Models	B-141
	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
Oceanographic Observed	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-139

Table C-16. District 14 coverage – atmospheric parameters.

Product Type	Provider	Product Name	Page
Wind Speed			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
	NOAA, NOS	CoastWatch Great Lakes Node Meteorological Observations	B-55
Air Temperature			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Air Temperature Max/Min			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Area Forecast			
Atmospheric Modeled	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39

Table C-16. District 14 coverage – atmospheric parameters (cont.).

Product Type	Provider	Product Name	Page
Atmospheric Pressure			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Ceiling			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Cloud Layers			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Dew Point			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39

Table C-16. District 14 coverage – atmospheric parameters (cont.).

Product Type	Provider	Product Name	Page
Icing Layer			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Icing Potential			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Precipitation Rate			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Relative Humidity			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Summary of Current Meteorological Conditions			
Atmospheric Modeled	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39

Table C-16. District 14 coverage – atmospheric parameters (cont.).

Product Type	Provider	Product Name	Page
Total Cloud Cover			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Visibility			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Weather Type			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	NOAA, NWS	National Digital Forecast Database	B-65
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Wind Chill			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Wind Stress			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109

Table C-16. District 14 coverage – atmospheric parameters (cont.).

Product Type	Provider	Product Name	Page
Wind Turbulent Kinetic Energy			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
Winds at Altitude			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39

Table C-17. District 14 coverage – oceanographic parameters.

Product Type	Provider	Product Name	Page
Currents			
Oceanographic Modeled	NOAA, NOS	Operational Coastal Models	B-51
	USN, NAVOCEANO	Global Navy Coastal Ocean Model (NCOM)	B-119
	Mercator-Ocean	Mercator Ocean Forecasts	B-31
	surflne.com	Models and Buoy Observations	B-93
	ESR	Ocean Surface Current Analyses - Real time (OSCAR)	B-15
	USN, NRL	HYbrid Coordinate Ocean Model (HYCOM)	B-129
Oceanographic Observed	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	JHU, APL	Sea Surface Temperature	B-27
Sea Surface Temperature			
Oceanographic Modeled	NOAA, NOS	Operational Coastal Models	B-51
	USN, NAVOCEANO	Global Navy Coastal Ocean Model (NCOM)	B-119
	Mercator-Ocean	Mercator Ocean Forecasts	B-31
	surflne.com	Models and Buoy Observations	B-93
	USN, NRL	HYbrid Coordinate Ocean Model (HYCOM)	B-129
Oceanographic Observed	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-139
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
	JHU, APL	Sea Surface Temperature	B-27
	NOAA, NESDIS	Advanced High Resolution (AVHRR) Pathfinder Sea Surface Temperature	B-49
	NOAA, NOS	Ocean Observations from NOS/NOAA Port	B-57
	NOAA, NESDIS	Sea Surface Temperature	B-47
Salinity			
Oceanographic Modeled	NOAA, NOS	Operational Coastal Models	B-51
	USN, NAVOCEANO	Global Navy Coastal Ocean Model (NCOM)	B-119
	Mercator-Ocean	Mercator Ocean Forecasts	B-31
	surflne.com	Models and Buoy Observations	B-93
	USN, NRL	HYbrid Coordinate Ocean Model (HYCOM)	B-129
Water Level			
Oceanographic Modeled	NOAA, NOS	Operational Coastal Models	B-51
	USN, NRL	HYbrid Coordinate Ocean Model (HYCOM)	B-129
Oceanographic Observed	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NOS	Ocean Observations from NOS/NOAA Port	B-57

Table C-17. District 14 coverage – oceanographic parameters (cont.).

Product Type	Provider	Product Name	Page
Wave Direction			
Oceanographic Modeled	UCSD, Scripps Institution of Oceanography	CDIP Wave Models	B-141
	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
	Oceanweather, Inc.	Global Wind/Wave Analysis and Forecast	B-73
	surflines.com	Models and Buoy Observations	B-93
Oceanographic Observed	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-139
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
Wave Significant Height			
Oceanographic Modeled	UCSD, Scripps Institution of Oceanography	CDIP Wave Models	B-141
	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
	Oceanweather, Inc.	Global Wind/Wave Analysis and Forecast	B-73
	surflines.com	Models and Buoy Observations	B-93
Oceanographic Observed	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-139
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
Wave Maximum Height			
Oceanographic Modeled	UCSD, Scripps Institution of Oceanography	CDIP Wave Models	B-141
	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
	Oceanweather, Inc.	Global Wind/Wave Analysis and Forecast	B-73
	surflines.com	Models and Buoy Observations	B-93
Oceanographic Observed	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-139
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43

Table C-17. District 14 coverage – oceanographic parameters (cont.).

Product Type	Provider	Product Name	Page
Wave Peak Period			
Oceanographic Modeled	UCSD, Scripps Institution of Oceanography	CDIP Wave Models	B-141
	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
	Oceanweather, Inc.	Global Wind/Wave Analysis and Forecast	B-73
	surflines.com	Models and Buoy Observations	B-93
Oceanographic Observed	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-139
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
White Cap Probability			
Oceanographic Modeled	UCSD, Scripps Institution of Oceanography	CDIP Wave Models	B-141
	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
Oceanographic Observed	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-139

Table C-18. District 17 coverage – atmospheric parameters.

Product Type	Provider	Product Name	Page
Wind Speed			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
	CALTECH, JPL	Ocean Wind	B-11
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
	JHU, APL	Ocean Marine Wind	B-25
	NOAA, NOS	CoastWatch Great Lakes Node Meteorological Observations	B-55
Air Temperature			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
	CALTECH, JPL	Ocean Wind	B-11
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Air Temperature Max/Min			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
	CALTECH, JPL	Ocean Wind	B-11
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Area Forecast			
Atmospheric Modeled	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
	CALTECH, JPL	Ocean Wind	B-11
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39

Table C-18. District 17 coverage – atmospheric parameters (cont.).

Product Type	Provider	Product Name	Page
Atmospheric Pressure			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
	CALTECH, JPL	Ocean Wind	B-11
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Ceiling			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Cloud Layers			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Dew Point			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39

Table C-18. District 17 coverage – atmospheric parameters (cont.).

Product Type	Provider	Product Name	Page
Icing Layer			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Icing Potential			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Precipitation Rate			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
	CALTECH, JPL	Ocean Wind	B-11
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Relative Humidity			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
	CALTECH, JPL	Ocean Wind	B-11
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39

Table C-18. District 17 coverage – atmospheric parameters (cont.).

Product Type	Provider	Product Name	Page
Summary of Current Meteorological Conditions			
Atmospheric Modeled	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
	CALTECH, JPL	Ocean Wind	B-11
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
	JHU, APL	Ocean Marine Wind	B-25
Total Cloud Cover			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Visibility			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Weather Type			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	NOAA, NWS	National Digital Forecast Database	B-65
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39
Wind Chill			
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Meteorological Observed	B-39

Table C-18. District 17 coverage – atmospheric parameters (cont.).

Product Type	Provider	Product Name	Page
Wind Stress			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	CALTECH, JPL	Ocean Wind	B-11
Atmospheric Observed	JHU, APL	Ocean Marine Wind	B-25
Wind Turbulent Kinetic Energy			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
Atmospheric Observed	JHU, APL	Ocean Marine Wind	B-25
Winds at Altitude			
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Meteorological Observed	B-39

Table C-19. District 17 coverage – oceanographic parameters.

Product Type	Provider	Product Name	Page
Currents			
Oceanographic Modeled	NOAA, NOS	Operational Coastal Models	B-51
	USN, NAVOCEANO	Global Navy Coastal Ocean Model (NCOM)	B-119
	Mercator-Ocean	Mercator Ocean Forecasts	B-31
	surflin.com	Models and Buoy Observations	B-93
	ASA	Regional Tidal Constituent Models	B-5
	UM, RSMAS	Extended Prince William Sound Nowcast/Forecast System (EPWS/NFS)	B-169
	ESR	Ocean Surface Current Analyses - Real time (OSCAR)	B-15
	CALTECH, JPL	Ocean Surface Current	B-9
Oceanographic Observed	USN, NRL	HYbrid Coordinate Ocean Model (HYCOM)	B-129
	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	JHU, APL	Sea Surface Temperature	B-27
	UAF, SFOS	Surface Currents	B-57
	AOOS	Observing System	B-3
Sea Surface Temperature			
Oceanographic Modeled	NOAA, NOS	Operational Coastal Models	B-51
	USN, NAVOCEANO	Global Navy Coastal Ocean Model (NCOM)	B-119
	Mercator-Ocean	Mercator Ocean Forecasts	B-31
	surflin.com	Models and Buoy Observations	B-93
	UM, RSMAS	Extended Prince William Sound Nowcast/Forecast System (EPWS/NFS)	B-169
	CALTECH, JPL	Ocean Surface Current	B-9
	USN, NRL	HYbrid Coordinate Ocean Model (HYCOM)	B-129
Oceanographic Observed	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-139
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
	JHU, APL	Sea Surface Temperature	B-27
	NOAA, NESDIS	Advanced High Resolution (AVHRR) Pathfinder Sea Surface Temperature	B-49
	NOAA, NOS	Ocean Observations from NOS/NOAA Port	B-57
	NOAA, NESDIS	Sea Surface Temperature	B-47
	NASA, MSFC	Sea Surface Temperature	B-35
	AOOS	Observing System	B-3
Ice Cover			
Oceanographic Modeled	Mercator-Ocean	Mercator Ocean Forecasts	B-31
	USN, NRL	HYbrid Coordinate Ocean Model (HYCOM)	B-129
Oceanographic Observed	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	NOAA, NOS	Ocean Observations from NOS/NOAA Port	B-57
	NASA, MSFC	Sea Ice	B-33

Table C-19. District 17 coverage – oceanographic parameters (cont.).

Product Type	Provider	Product Name	Page
Ice Type			
Oceanographic Observed	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	NOAA, NOS	Ocean Observations from NOS/NOAA Port	B-57
	NASA, MSFC	Sea Ice	B-33
Salinity			
Oceanographic Modeled	NOAA, NOS	Operational Coastal Models	B-51
	USN, NAVOCEANO	Global Navy Coastal Ocean Model (NCOM)	B-119
	Mercator-Ocean	Mercator Ocean Forecasts	B-31
	surflne.com	Models and Buoy Observations	B-93
	UM, RSMAS	Extended Prince William Sound Nowcast/Forecast System (EPWS/NFS)	B-169
	CALTECH, JPL	Ocean Surface Current	B-9
	USN, NRL	HYbrid Coordinate Ocean Model (HYCOM)	B-129
Oceanographic Observed	AOOS	Observing System	B-3
Turbulent Dispersion Coefficient			
Oceanographic Modeled	UM, RSMAS	Extended Prince William Sound Nowcast/Forecast System (EPWS/NFS)	B-169
Turbulent Kinetic Energy			
Oceanographic Modeled	Mercator-Ocean	Mercator Ocean Forecasts	B-31
	UM, RSMAS	Extended Prince William Sound Nowcast/Forecast System (EPWS/NFS)	B-169
Turbulent Velocity Variance			
Oceanographic Modeled	UM, RSMAS	Extended Prince William Sound Nowcast/Forecast System (EPWS/NFS)	B-169
Water Level			
Oceanographic Modeled	NOAA, NOS	Operational Coastal Models	B-51
	UM, RSMAS	Extended Prince William Sound Nowcast/Forecast System (EPWS/NFS)	B-169
	CALTECH, JPL	Ocean Surface Current	B-9
	USN, NRL	HYbrid Coordinate Ocean Model (HYCOM)	B-129
Oceanographic Observed	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
	NOAA, NOS	Ocean Observations from NOS/NOAA Port	B-57
	AOOS	Observing System	B-3

Table C-19. District 17 coverage – oceanographic parameters (cont.).

Product Type	Provider	Product Name	Page
Wave Direction			
Oceanographic Modeled	UCSD, Scripps Institution of Oceanography	CDIP Wave Models	B-141
	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
	Oceanweather, Inc.	Global Wind/Wave Analysis and Forecast	B-73
	surflines.com	Models and Buoy Observations	B-93
Oceanographic Observed	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-139
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	AOOS	Observing System	B-3
Wave Significant Height			
Oceanographic Modeled	UCSD, Scripps Institution of Oceanography	CDIP Wave Models	B-141
	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
	Oceanweather, Inc.	Global Wind/Wave Analysis and Forecast	B-73
	surflines.com	Models and Buoy Observations	B-93
Oceanographic Observed	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-139
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
	AOOS	Observing System	B-3
Wave Maximum Height			
Oceanographic Modeled	UCSD, Scripps Institution of Oceanography	CDIP Wave Models	B-141
	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
	Oceanweather, Inc.	Global Wind/Wave Analysis and Forecast	B-73
	surflines.com	Models and Buoy Observations	B-93
Oceanographic Observed	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-139
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	AOOS	Observing System	B-3

Table C-19. District 17 coverage – oceanographic parameters (cont.).

Product Type	Provider	Product Name	Page
Wave Peak Period			
Oceanographic Modeled	UCSD, Scripps Institution of Oceanography	CDIP Wave Models	B-141
	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
	Oceanweather, Inc.	Global Wind/Wave Analysis and Forecast	B-73
	surflines.com	Models and Buoy Observations	B-93
Oceanographic Observed	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-139
	NOAA, NESDIS	NDBC Meteorological Buoys	B-43
	NOAA, NESDIS	NCDC Oceanographic Observed	B-41
	NOAA, NESDIS	NDBC Oceanographic Buoys	B-45
	AOOS	Observing System	B-3
White Cap Probability			
Oceanographic Modeled	UCSD, Scripps Institution of Oceanography	CDIP Wave Models	B-141
	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
Oceanographic Observed	UCSD, Scripps Institution of Oceanography	CDIP Wave Buoys	B-139

Table C-19. District 17 coverage – oceanographic parameters (cont.).

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APPENDIX D. LIST OF PRODUCTS AVAILABLE BY PARAMETER

ATMOSPHERIC PARAMETERS

Table D-1. Surface winds.

Product Type	Provider	Product Name	Page
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USN, FNMOC	Navy Coupled Ocean Data Assimilation (NCODA) - Atmospheric	B-115
	Weather Flow Inc.	Mesoscale Atmospheric Model	B-201
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	UNF, CCEC	HiRes WRF Model	B-177
	USN, NPS	Center for Integrated Marine Technologies (CIMT) Real-time Wind Product - Model	B-121
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
	CALTECH, JPL	Ocean Wind	B-11
Atmospheric Observed	Weather Flow Inc.	National Mesonet	B-203
	NOAA, NESDIS	NDBC Buoys Meteorological	B-43
	NOAA, NESDIS	NCDC Observed Meteorological	B-39
	UMaine, SMS	Gulf of Maine Ocean Observing System (GoMOOS) Buoys Meteorological	B-155
	NOAA, NOS	National Estuarine Research Reserve System (NERRS) System-Wide Monitoring Program (SWMP)	B-59
	FSU, COAPS	FSU QuikSCAT Objective Gridded Winds	B-19
	JHU, APL	Ocean Marine Wind	B-25
	USC, Baruch Institute	Carolinas Coast Meteorological	B-189
	USN, NPS	Center for Integrated Marine Technologies (CIMT) Real-time Wind Product - Data /data	B-123
	USC, Baruch Institute	Carolinas Coastal Ocean Observing and Prediction System (Caro-COOPS) Meteorological	B-185
	UMCES	Observing System Meteorological	B-161
	NOAA, NOS	CoastWatch Great Lakes Node Meteorological Observations	B-55
	WHOI	Martha's Vineyard Coastal Observatory (MVCO) - Meteorological	B-205
	TAMU, Oceanography Department	GCOOS In Situ Observations	B-95
	USC, Baruch Institute	Southeast U.S. Atlantic Coastal Ocean Observing System (SEACOOS) Meteorological	B-181

Table D-2. Air temperature.

Product Type	Provider	Product Name	Page
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USN, FNMOC	Navy Coupled Ocean Data Assimilation (NCODA) - Atmospheric	B-115
	Weather Flow Inc.	Mesoscale Atmospheric Model	B-201
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	UNF, CCEC	HiRes WRF Model	B-177
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
	CALTECH, JPL	Ocean Wind	B-11
Atmospheric Observed	Weather Flow Inc.	National Mesonet	B-203
	NOAA, NESDIS	NDBC Buoys Meteorological	B-43
	NOAA, NESDIS	NCDC Observed Meteorological	B-39
	UMaine, SMS	Gulf of Maine Ocean Observing System (GoMOOS) Buoys Meteorological	B-155
	NOAA, NOS	National Estuarine Research Reserve System (NERRS) System-Wide Monitoring Program (SWMP)	B-59
	USC, Baruch Institute	Carolinas Coast Meteorological	B-189
	USC, Baruch Institute	Southeast U.S. Atlantic Coastal Ocean Observing System (SEACOOS) Meteorological	B-181
	USC, Baruch Institute	Carolinas Coastal Ocean Observing and Prediction System (Caro-COOPS) Meteorological	B-185
	UMCES	Observing System Meteorological	B-161
	WHOI	Martha's Vineyard Coastal Observatory (MVCO) - Meteorological	B-205
	TAMU, Oceanography Department	GCOOS In Situ Observations	B-95

Table D-3. Air temperature max/min.

Product Type	Provider	Product Name	Page
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	Weather Flow Inc.	Mesoscale Atmospheric Model	B-201
	NOAA, NWS	National Digital Forecast Database	B-65
	UNF, CCEC	HiRes WRF Model	B-177
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
	CALTECH, JPL	Ocean Wind	B-11
Atmospheric Observed	NOAA, NESDIS	NDBC Buoys Meteorological	B-43
	NOAA, NESDIS	NCDC Observed Meteorological	B-39
	NOAA, NOS	National Estuarine Research Reserve System (NERRS) System-Wide Monitoring Program (SWMP)	B-59
	USC, Baruch Institute	Carolinas Coastal Ocean Observing and Prediction System (Caro-COOPS) Meteorological	B-185
	WHOI	Martha's Vineyard Coastal Observatory (MVCO) - Meteorological	B-205

Table D-4. Area forecast.

Product Type	Provider	Product Name	Page
Atmospheric Modeled	UNF, CCEC	HiRes WRF Model	B-177
	USN, NPS	Center for Integrated Marine Technologies (CIMT) Real-time Wind Product - Model	B-121
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
	CALTECH, JPL	Ocean Wind	B-11
Atmospheric Observed	NOAA, NESDIS	NCDC Observed Meteorological	B-39
	USC, Baruch Institute	Carolinas Coast Meteorological	B-189
	USN, NPS	Center for Integrated Marine Technologies (CIMT) Real-time Wind Product - Data /data	B-123

Table D-5. Atmospheric pressure.

Product Type	Provider	Product Name	Page
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USN, FNMOC	Navy Coupled Ocean Data Assimilation (NCODA) - Atmospheric	B-115
	Weather Flow Inc.	Mesoscale Atmospheric Model	B-201
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	UNF, CCEC	HiRes WRF Model	B-177
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
	CALTECH, JPL	Ocean Wind	B-11
Atmospheric Observed	Weather Flow Inc.	National Mesonet	B-203
	NOAA, NESDIS	NCDC Observed Meteorological	B-39
	UMaine, SMS	Gulf of Maine Ocean Observing System (GoMOOS) Buoys Meteorological	B-155
	NOAA, NOS	National Estuarine Research Reserve System (NERRS) System-Wide Monitoring Program (SWMP)	B-59
	USC, Baruch Institute	Carolinas Coast Meteorological	B-189
	USC, Baruch Institute	Southeast U.S. Atlantic Coastal Ocean Observing System (SEACOOS) Meteorological	B-181
	USC, Baruch Institute	Carolinas Coastal Ocean Observing and Prediction System (Caro-COOPS) Meteorological	B-185
	WHOI	Martha's Vineyard Coastal Observatory (MVCO) - Meteorological	B-205

Table D-6. Ceiling.

Product Type	Provider	Product Name	Page
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Coupled Ocean Data Assimilation (NCODA) - Atmospheric	B-115
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Observed Meteorological	B-39

Table D-7. Cloud layers.

Product Type	Provider	Product Name	Page
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USN, FNMOC	Navy Coupled Ocean Data Assimilation (NCODA) - Atmospheric	B-115
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Observed Meteorological	B-39

Table D-8. Dew point.

Product Type	Provider	Product Name	Page
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USN, FNMOC	Navy Coupled Ocean Data Assimilation (NCODA) - Atmospheric	B-115
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	UNF, CCEC	HiRes WRF Model	B-177
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Buoys Meteorological	B-43
	NOAA, NESDIS	NCDC Observed Meteorological	B-39

Table D-9. Icing layer.

Product Type	Provider	Product Name	Page
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USN, FNMOC	Navy Coupled Ocean Data Assimilation (NCODA) - Atmospheric	B-115
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Observed Meteorological	B-39

Table D-10. Icing potential.

Product Type	Provider	Product Name	Page
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Coupled Ocean Data Assimilation (NCODA) - Atmospheric	B-115
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Buoys Meteorological	B-43
	NOAA, NESDIS	NCDC Observed Meteorological	B-39

Table D-11. Precipitation rate.

Product Type	Provider	Product Name	Page
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USN, FNMOC	Navy Coupled Ocean Data Assimilation (NCODA) - Atmospheric	B-115
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	UNF, CCEC	HiRes WRF Model	B-177
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
	CALTECH, JPL	Ocean Wind	B-11
Atmospheric Observed	NOAA, NESDIS	NCDC Observed Meteorological	B-39
	NOAA, NOS	National Estuarine Research Reserve System (NERRS) System-Wide Monitoring Program (SWMP)	B-59

Table D-12. Relative humidity.

Product Type	Provider	Product Name	Page
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USN, FNMOC	Navy Coupled Ocean Data Assimilation (NCODA) - Atmospheric	B-115
	Weather Flow Inc.	Mesoscale Atmospheric Model	B-201
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	UNF, CCEC	HiRes WRF Model	B-177
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
	CALTECH, JPL	Ocean Wind	B-11
Atmospheric Observed	NOAA, NESDIS	NCDC Observed Meteorological	B-39
	NOAA, NOS	National Estuarine Research Reserve System (NERRS) System-Wide Monitoring Program (SWMP)	B-59
	USC, Baruch Institute	Carolinas Coast Meteorological	B-189
	USC, Baruch Institute	Southeast U.S. Atlantic Coastal Ocean Observing System (SEACOOS) Meteorological	B-181
	USC, Baruch Institute	Carolinas Coastal Ocean Observing and Prediction System (Caro-COOPS) Meteorological	B-185
	UMCES	Observing System Meteorological	B-161
	WHOI	Martha's Vineyard Coastal Observatory (MVCO) - Meteorological	B-205

Table D-13. Summary of current meteorological conditions.

Product Type	Provider	Product Name	Page
Atmospheric Modeled	Weather Flow Inc.	Mesoscale Atmospheric Model	B-201
	USN, NPS	Center for Integrated Marine Technologies (CIMT) Real-time Wind Product - Model	B-121
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
	CALTECH, JPL	Ocean Wind	B-11
Atmospheric Observed	NOAA, NESDIS	NCDC Observed Meteorological	B-39
	UMaine, SMS	Gulf of Maine Ocean Observing System (GoMOOS) Buoys Meteorological	B-155
	JHU, APL	Ocean Marine Wind	B-25
	USN, NPS	Center for Integrated Marine Technologies (CIMT) Real-time Wind Product - Data /data	B-123
	WHOI	Martha's Vineyard Coastal Observatory (MVCO) - Meteorological	B-205

Table D-14. Total cloud cover.

Product Type	Provider	Product Name	Page
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USN, FNMOC	Navy Coupled Ocean Data Assimilation (NCODA) - Atmospheric	B-115
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Observed Meteorological	B-39

Table D-15. Visibility.

Product Type	Provider	Product Name	Page
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USN, FNMOC	Navy Coupled Ocean Data Assimilation (NCODA) - Atmospheric	B-115
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	UNF, CCEC	HiRes WRF Model	B-177
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Buoys Meteorological	B-43
	NOAA, NESDIS	NCDC Observed Meteorological	B-39
	UMaine, SMS	Gulf of Maine Ocean Observing System (GoMOOS) Buoys Meteorological	B-155
	USC, Baruch Institute	Carolinas Coastal Ocean Observing and Prediction System (Caro-COOPS) Meteorological	B-185
	USC, Baruch Institute	Southeast U.S. Atlantic Coastal Ocean Observing System (SEACOOS) Meteorological	B-181

Table D-16. Weather type.

Product Type	Provider	Product Name	Page
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	NOAA, NWS	National Digital Forecast Database	B-65
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Observed Meteorological	B-39

Table D-17. Wind chill.

Product Type	Provider	Product Name	Page
Atmospheric Modeled	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	NOAA, NWS	National Digital Forecast Database	B-65
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NDBC Buoys Meteorological	B-43
	NOAA, NESDIS	NCDC Observed Meteorological	B-39

Table D-18. Wind stress.

Product Type	Provider	Product Name	Page
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USN, FNMOC	Navy Coupled Ocean Data Assimilation (NCODA) - Atmospheric	B-115
	Weather Flow Inc.	Mesoscale Atmospheric Model	B-201
	UNF, CCEC	HiRes WRF Model	B-177
	CALTECH, JPL	Ocean Wind	B-11
Atmospheric Observed	FSU, COAPS	FSU QuikSCAT Objective Gridded Winds	B-19
	JHU, APL	Ocean Marine Wind	B-25
	WHOI	Martha's Vineyard Coastal Observatory (MVCO) - Meteorological	B-205

Table D-19. Wind turbulent kinetic energy.

Product Type	Provider	Product Name	Page
Atmospheric Modeled	Mercator-Ocean	Mercator Ocean Forecasts	B-31
	UM, RSMAS	Extended Prince William Sound Nowcast/Forecast System (EPWS/NFS)	B-17
	UM, RSMAS	East Florida Shelf Information System (EFSIS)	B-167

Table D-20. Winds at altitude.

Product Type	Provider	Product Name	Page
Atmospheric Modeled	USN, FNMOC	Centralized Atmospheric Analysis and Prediction System (CAAPS)	B-107
	NOAA, NWS	North American Mesoscale (NAM) Model Guidance Products	B-69
	USN, FNMOC	Navy Operational Global Atmospheric Prediction System (NOGAPS)	B-109
	USN, FNMOC	Navy Coupled Ocean Data Assimilation (NCODA) - Atmospheric	B-115
	USAF, AFWA	Weather Research and Forecasting (WRF) Model	B-103
	UNF, CCEC	HiRes WRF Model	B-177
	NOAA, NESDIS	NCDC Meteorological Modeled (NCEP)	B-37
Atmospheric Observed	NOAA, NESDIS	NCDC Observed Meteorological	B-39

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Table D-21. Currents.

Product Type	Provider	Product Name	Page
Oceanographic Modeled	NOAA, NOS	Operational Coastal Models	B-51
	USN, FNMOC	Navy Coupled Ocean Data Assimilation (NCODA) - Oceanographic	B-117
	Stevens Institute of Technology, CMS/ Davidson Laboratory	New York Harbor Observation and Prediction System (NYHOPS)	B-89
	NOAA, NOS	Chesapeake Bay Model	B-63
	USN, NAVOCEANO	Global Navy Coastal Ocean Model (NCOM)	B-119
	NOAA, NWS	Real Time Ocean Forecast System (RTOFS)	B-67
	Mercator-Ocean	Mercator Ocean Forecasts	B-31
	surflines.com	Models and Buoy Observations	B-93
	UM, RSMAS	Extended Prince William Sound Nowcast/Forecast System (EPWS/NFS)	B-169
	UM, RSMAS	East Florida Shelf Information System (EFSIS)	B-167
	ASA	Regional Tidal Constituent Models	B-5
	USN, NRL	Intra-Americas Sea Ocean Nowcast/Forecast System (IASNFS)	B-127
	TAMU, Oceanography Department	Texas Automated Buoy System (TABS) Model	B-97
	USF, College of Marine Science	West Florida Shelf (WFS) Circulation Model	B-197
	ESR	Ocean Surface Current Analyses - Real Time (OSCAR)	B-15
	CALTECH, JPL	Ocean Surface Current	B-9
	USN, NRL	Hybrid Coordinate Ocean Model (HYCOM)	B-129
	UMaine, SMS	Gulf of Maine Ocean Currents Model	B-153
	OHSU, CCALMR	CORIE Models	B-75
Oceanographic Observed	SIT, CMS/ Davidson Laboratory	New York Harbor Observing System (NYHOS)	B-91
	TAMU-CC, CBI	Texas Coastal Ocean Observation Network (TCOON)	B-99
	UM, RSMAS	Eastern Florida Shelf High Frequency Radar	B-165
	NOAA, NOS	PORTS Surface Current Data	B-53
	Rutgers University, IMCS	Coastal Ocean Observation Lab (COOL)	B-81
	USF, College of Marine Science	IMaRS Observing System	B-199
	AOOS	Observing System	B-3
	OSU, COAS	Surface Current Maps	B-79
	UCDavis, BML	Bodega Ocean Observing Node (BOON)	B-133
	UNCW, CMS	Coastal Ocean Research & Monitoring Program (CORMP) Observing System	B-175
	USC	Observing System	B-179
	NOAA, NESDIS	NDBC Buoys Oceanographic	B-45
	College of William and Mary, VIMS	Observing System	B-13
	NOAA, NOS	PORTS Surface Current Data	B-53
	UCSB, MSI	Observing System	B-143

Table D-21. Currents (cont.).

Product Type	Provider	Product Name	Page
Oceanographic Observed (cont.)	USN, NPS	Central and Northern California Ocean Observing System (CeNCOOS), Coastal Ocean Currents Monitoring Program (COCMP)	B-125
	Texas GLO	Texas Automated Buoy System	B-101
	UConn, Marine Sciences Department	Long Island Sound Integrated Coastal Observing System (LISICOS)	B-145
	UCSD, Scripps	Near Real-Time Surface Currents - California	B-137
	UCSD, Scripps	Coastal Observing Research and Development Center (CORDC) Surface Current Data Management System	B-137
	LSU, CSI	Wave-Current-Surge Information System (WAVCIS)	B-29
	SECOORA	North Carolina Coastal Ocean Observing System (NCCOOS)	B-83
	UAF, SFOS	Surface Currents	B-131
	USF, College of Marine Science	Coastal Ocean Modeling and Prediction System (COMPS)	B-193
	UMaine, SMS	Gulf of Maine Ocean Observing System (GoMOOS) Buoys Oceanographic	B-155
	Horizon Marine, Inc.	Eddy Watch – Observing System	B-23
	USF, College of Marine Science	Observing System	B-195
	UGA, SkIO	South Atlantic Bight Synoptic Offshore Observational Network (SABSOON) Observing System	B-151
	UMaine, SMS	Gulf of Maine Ocean Observing System (GoMOOS) CODAR	B-155
	WHOI	Martha's Vineyard Coastal Observatory (MVCO) - Oceanographic	B-207
	OHSU, CCALMR	CORIE Observations	B-77
	University of Delaware, CMES	Delaware Bay Mouth HF Radar Network	B-147
	University of Delaware, CMES	Delaware Bay Observing System (DBOS)	B-149
	FIT, DMES	Observing System	B-17
	NANOOS	Northwest Association of Networked Ocean Observing Systems (NANOOS)	B-71
	USC, Baruch Institute	Carolinas Coastal Ocean Observing and Prediction System (Caro-COOPS) Oceanographic	B-187
	USC, Baruch Institute	Southeast U.S. Atlantic Coastal Ocean Observing System (SEACOOS) Oceanographic	B-183
	USC, Baruch Institute	Carolinas Coast Oceanographic	B-191
	UMCES	Observing System Oceanographic	B-161

Table D-22. Sea surface temperature.

Product Type	Provider	Product Name	Page
Oceanographic Modeled	NOAA, NOS	Operational Coastal Models	B-51
	USN, FNMOC	Navy Coupled Ocean Data Assimilation (NCODA) - Oceanographic	B-117
	Stevens Institute of Technology, CMS/ Davidson Laboratory	New York Harbor Observation and Prediction System (NYHOPS)	B-89
	NOAA, NOS	Chesapeake Bay Model	B-63
	USN, NAVOCEANO	Global Navy Coastal Ocean Model (NCOM)	B-119
	NOAA, NWS	Real Time Ocean Forecast System (RTOFS)	B-67
	Mercator-Ocean	Mercator Ocean Forecasts	B-31
	surflin.com	Models and Buoy Observations	B-93
	UM, RSMAS	Extended Prince William Sound Nowcast/Forecast System (EPWS/NFS)	B-169
	UM, RSMAS	East Florida Shelf Information System (EFSIS)	B-167
	USN, NRL	Intra-Americas Sea Ocean Nowcast/Forecast System (IASNFS)	B-127
	USF, College of Marine Science	West Florida Shelf (WFS) Circulation Model	B-197
	CALTECH, JPL	Ocean Surface Current	B-9
	USN, NRL	Hybrid Coordinate Ocean Model (HYCOM)	B-129
	UMaine, SMS	Gulf of Maine Ocean Currents Model	B-153
	OHSU, CCALMR	CORIE Models	B-75
Oceanographic Observed	UCSD, Scripps	CDIP Wave Buoys	B-139
	TAMU-CC, CBI	Texas Coastal Ocean Observation System	B-99
	USGS, Water Resources	National Water Information System (NWIS) Surface-Water Data	B-105
	NOAA, NOS	PORTS Surface Current Data	B-53
	Rutgers University, IMCS	Coastal Ocean Observation Lab (COOL)	B-81
	USF, College of Marine Science	IMaRS Observing System	B-199
	AOOS	Observing System	B-3
	UCDavis, BML	Bodega Ocean Observing Node (BOON)	B-133
	UNCW, CMS	Coastal Ocean Research & Monitoring Program (CORMP) Observing System	B-175
	NOAA, NESDIS	NCDC Observed Oceanographic	B-41
	NOAA, NESDIS	NDBC Buoys Oceanographic	B-45
	College of William and Mary, VIMS	Observing System	B-13
	NOAA, NOS	National Estuarine Research Reserve System (NERRS) System-Wide Monitoring Program (SWMP)	B-61
	JHU, APL	Sea Surface Temperature	B-27
	Texas GLO	Texas Automated Buoy System	B-101
	NOAA, NESDIS	Advanced High Resolution (AVHRR) Pathfinder Sea Surface Temperature	B-49
	UConn, Marine Sciences Department	Long Island Sound Integrated Coastal Observing System (LISICOS)	B-145

Table D-22. Sea surface temperature (cont.).

Product Type	Provider	Product Name	Page
Oceanographic Observed (cont.)	LSU, CSI	Wave-Current-Surge Information System (WAVCIS)	B-29
	SECOORA	North Carolina Coastal Ocean Observing System (NCCOOS)	B-83
	NOAA, NOS	CoastWatch Great Lakes Node Oceanographic Observations	B-57
	USF, College of Marine Science	Coastal Ocean Modeling and Prediction System (COMPS)	B-193
	UMaine, SMS	Gulf of Maine Ocean Observing System (GoMOOS) Buoys Oceanographic	B-155
	NOAA, NESDIS	Sea Surface Temperature	B-47
	USF, College of Marine Science	Observing System	B-195
	UGA, SkIO	South Atlantic Bight Synoptic Offshore Observational Network (SABSOON) Observing System	B-151
	NASA, MSFC	Sea Surface Temperature	B-35
	WHOI	Martha's Vineyard Coastal Observatory (MVCO) - Oceanographic	B-207
	OHSU, CCALMR	CORIE Observations	B-77
	University of Delaware, CMES	Delaware Bay Observing System (DBOS)	B-149
	FIT, DMES	Observing System	B-17
	NANOOS	Northwest Association of Networked Ocean Observing Systems (NANOOS)	B-71
	USC, Baruch Institute	Carolinas Coast Oceanographic	B-191
	USC, Baruch Institute	Southeast U.S. Atlantic Coastal Ocean Observing System (SEACOOS) Oceanographic	B-183
	USC, Baruch Institute	Carolinas Coastal Ocean Observing and Prediction System (Caro-COOPS) Oceanographic	B-187
	SURA	Interoperability Demonstration Web Site	B-85
	UMCES	Observing System Oceanographic	B-161

Table D-23. Ice cover.

Product Type	Provider	Product Name	Page
Oceanographic Modeled	USN, FNMOC	Navy Coupled Ocean Data Assimilation (NCODA) - Oceanographic	B-117
	Mercator-Ocean	Mercator Ocean Forecasts	B-31
	USN, NRL	Hybrid Coordinate Ocean Model (HYCOM)	B-129
Oceanographic Observed	NOAA, NESDIS	NCDC Observed Oceanographic	B-41
	NOAA, NOS	CoastWatch Great Lakes Node Oceanographic Observations	B-57
	NASA, MSFC	Sea Ice	B-33

Table D-24. Ice thickness.

Product Type	Provider	Product Name	Page
Oceanographic Modeled	Mercator-Ocean	Mercator Ocean Forecasts	B-31
	USN, NRL	Hybrid Coordinate Ocean Model (HYCOM)	B-129
Oceanographic Observed	NOAA, NOS	CoastWatch Great Lakes Node Oceanographic Observations	B-57

Table D-25. Ice type.

Product Type	Provider	Product Name	Page
Oceanographic Modeled	Mercator-Ocean	Mercator Ocean Forecasts	B-31
	USN, NRL	Hybrid Coordinate Ocean Model (HYCOM)	B-129
Oceanographic Observed	NOAA, NOS	CoastWatch Great Lakes Node Oceanographic Observations	B-57

Table D-26. River discharge.

Product Type	Provider	Product Name	Page
Oceanographic Modeled	Stevens Institute of Technology, CMS/ Davidson Laboratory	New York Harbor Observation and Prediction System (NYHOPS)	B-89
	NOAA, NOS	Chesapeake Bay Model	B-63
	ASA	Regional Tidal Constituent Models	B-5
	OHSU, CCALMR	CORIE Models	B-75
Oceanographic Observed	SIT, CMS/ Davidson Laboratory	New York Harbor Observing System (NYHOS)	B-91
	USGS, Water Resources	National Water Information System (NWIS) Surface-Water Data	B-105
	USF, College of Marine Science	IMaRS Observing System	B-199
	AOOS	Observing System	B-3

Table D-27. Salinity.

Product Type	Provider	Product Name	Page
Oceanographic Modeled	NOAA, NOS	Operational Coastal Models	B-51
	USN, FNMOC	Navy Coupled Ocean Data Assimilation (NCODA) - Oceanographic	B-117
	Stevens Institute of Technology, CMS/ Davidson Laboratory	New York Harbor Observation and Prediction System (NYHOPS)	B-89
	NOAA, NOS	Chesapeake Bay Model	B-63
	USN, NAVOCEANO	Global Navy Coastal Ocean Model (NCOM)	B-119
	NOAA, NWS	Real Time Ocean Forecast System (RTOFS)	B-67
	Mercator-Ocean	Mercator Ocean Forecasts	B-31
	surflines.com	Models and Buoy Observations	B-93
	UM, RSMAS	Extended Prince William Sound Nowcast/Forecast System (EPWS/NFS)	B-169
	UM, RSMAS	East Florida Shelf Information System (EFSIS)	B-167
	USN, NRL	Intra-Americas Sea Ocean Nowcast/Forecast System (IASNFS)	B-127
	USF, College of Marine Science	West Florida Shelf (WFS) Circulation Model	B-197
	CALTECH, JPL	Ocean Surface Current	B-9
	USN, NRL	Hybrid Coordinate Ocean Model (HYCOM)	B-129
	UMaine, SMS	Gulf of Maine Ocean Currents Model	B-153
	OHSU, CCALMR	CORIE Models	B-75
Oceanographic Observed	SIT, CMS/ Davidson Laboratory	New York Harbor Observing System (NYHOS)	B-91
	TAMU-CC, CBI	Texas Coastal Ocean Observation System	B-99
	USGS, Water Resources	National Water Information System (NWIS) Surface-Water Data	B-105
	NOAA, NOS	PORTS Surface Current Data	B-53
	USF, College of Marine Science	IMaRS Observing System	B-199
	AOOS	Observing System	B-3
	UCDavis, BML	Bodega Ocean Observing Node (BOON)	B-133
	UNCW, CMS	Coastal Ocean Research & Monitoring Program (CORMP) Observing System	B-175
	College of William and Mary, VIMS	Observing System	B-13
	NOAA, NOS	National Estuarine Research Reserve System (NERRS) System-Wide Monitoring Program (SWMP)	B-61
	Texas GLO	Texas Automated Buoy System	B-101
	UConn, Marine Sciences Department	Long Island Sound Integrated Coastal Observing System (LISICOS)	B-145
	LSU, CSI	Wave-Current-Surge Information System (WAVCIS)	B-29
	SECOORA	North Carolina Coastal Ocean Observing System (NCCOOS)	B-83
	USF, College of Marine Science	Coastal Ocean Modeling and Prediction System (COMPS)	B-193
	UMaine, SMS	Gulf of Maine Ocean Observing System (GoMOOS) Buoys Oceanographic	B-155

Table D-27. Salinity (cont).

Product Type	Provider	Product Name	Page
Oceanographic Observed (cont.)	USF, College of Marine Science	Observing System	B-195
	UGA, SkIO	South Atlantic Bight Synoptic Offshore Observational Network (SABSOON) Observing System	B-151
	WHOI	Martha's Vineyard Coastal Observatory (MVCO) - Oceanographic	B-207
	OHSU, CCALMR	CORIE Observations	B-77
	University of Delaware, CMES	Delaware Bay Observing System (DBOS)	B-149
	NANOOS	Northwest Association of Networked Ocean Observing Systems (NANOOS)	B-71
	USC, Baruch Institute	Carolinas Coast Oceanographic	B-191
	USC, Baruch Institute	Carolinas Coastal Ocean Observing and Prediction System (Caro-COOPS) Oceanographic	B-187
	USC, Baruch Institute	Southeast U.S. Atlantic Coastal Ocean Observing System (SEACOOS) Oceanographic	B-183

Table D-28. Turbidity.

Product Type	Provider	Product Name	Page
Oceanographic Observed	SIT, CMS/ Davidson Laboratory	New York Harbor Observing System (NYHOS)	B-91
	USGS, Water Resources	National Water Information System (NWIS) Surface-Water Data	B-105
	USF, College of Marine Science	IMaRS Observing System	B-199
	College of William and Mary, VIMS	Observing System	B-13
	NOAA, NOS	National Estuarine Research Reserve System (NERRS) System-Wide Monitoring Program (SWMP)	B-61
	LSU, CSI	Wave-Current-Surge Information System (WAVCIS)	B-29
	UMCES	Observing System Oceanographic	B-161

Table D-29. Turbulent dispersion coefficient.

Product Type	Provider	Product Name	Page
Oceanographic Modeled	NOAA, NOS	Chesapeake Bay Model	B-63
	UM, RSMAS	Extended Prince William Sound Nowcast/Forecast System (EPWS/NFS)	B-169
	UM, RSMAS	East Florida Shelf Information System (EFSIS)	B-167
	UMaine, SMS	Gulf of Maine Ocean Currents Model	B-153

Table D-30. Turbulent kinetic energy.

Product Type	Provider	Product Name	Page
Oceanographic Modeled	Mercator-Ocean	Mercator Ocean Forecasts	B-31
	UM, RSMAS	Extended Prince William Sound Nowcast/Forecast System (EPWS/NFS)	B-169
	UM, RSMAS	East Florida Shelf Information System (EFSIS)	B-167

Table D-31. Turbulent velocity variance.

Product Type	Provider	Product Name	Page
Oceanographic Modeled	UM, RSMAS	Extended Prince William Sound Nowcast/Forecast System (EPWS/NFS)	B-169
	UM, RSMAS	East Florida Shelf Information System (EFSIS)	B-167

Table D-32. Water level.

Product Type	Provider	Product Name	Page
Oceanographic Modeled	NOAA, NOS	Operational Coastal Models	B-51
	Stevens Institute of Technology, CMS/ Davidson Laboratory	New York Harbor Observation and Prediction System (NYHOPS)	B-89
	NOAA, NOS	Chesapeake Bay Model	B-63
	NOAA, NWS	Real Time Ocean Forecast System (RTOFS)	B-67
	UM, RSMAS	Extended Prince William Sound Nowcast/Forecast System (EPWS/NFS)	B-167
	UM, RSMAS	East Florida Shelf Information System (EFSIS)	B-167
	USN, NRL	Intra-Americas Sea Ocean Nowcast/Forecast System (IASNFS)	B-127
	CALTECH, JPL	Ocean Surface Current	B-9
	USN, NRL	Hybrid Coordinate Ocean Model (HYCOM)	B-129
	UMaine, SMS	Gulf of Maine Ocean Currents Model	B-153
	OHSU, CCALMR	CORIE Models	B-75
Oceanographic Observed	SIT, CMS/ Davidson Laboratory	New York Harbor Observing System (NYHOS)	B-91
	TAMU-CC, CBI	Texas Coastal Ocean Observation System	B-99
	USGS, Water Resources	National Water Information System (NWIS) Surface-Water Data	B-105
	NOAA, NOS	PORTS Surface Current Data	B-53
	AOOS	Observing System	B-3
	UCDavis, BML	Bodega Ocean Observing Node (BOON)	B-133
	UNCW, CMS	Coastal Ocean Research & Monitoring Program (CORMP) Observing System	B-175
	NOAA, NESDIS	NDBC Buoys Oceanographic	B-45
	NOAA, NOS	PORTS Surface Current Data	B-53
	College of William and Mary, VIMS	Observing System	B-13
	LSU, CSI	Wave-Current-Surge Information System (WAVCIS)	B-29
	SECOORA	North Carolina Coastal Ocean Observing System (NCCOOS)	B-83
	NOAA, NOS	CoastWatch Great Lakes Node Oceanographic Observations	B-57
	USF, College of Marine Science	Coastal Ocean Modeling and Prediction System (COMPS)	B-193
	USF, College of Marine Science	Observing System	B-195
	UGA, SkIO	South Atlantic Bight Synoptic Offshore Observational Network (SABSOON) Observing System	B-151
	WHOI	Martha's Vineyard Coastal Observatory (MVCO) - Oceanographic	B-207
	OHSU, CCALMR	CORIE Observations	B-77
	FIT, DMES	Observing System	B-17
	USC, Baruch Institute	Carolinas Coast Oceanographic	B-191
	USC, Baruch Institute	Southeast U.S. Atlantic Coastal Ocean Observing System (SEACOOS) Oceanographic	B-183
	USC, Baruch Institute	Carolinas Coastal Ocean Observing and Prediction System (Caro-COOPS) Oceanographic	B-187
	SURA	Interoperability Demonstration Web Site	B-85

Table D-33. Wave direction.

Product Type	Provider	Product Name	Page
Oceanographic Modeled	UCSD, Scripps Institution of Oceanography	CDIP Wave Models	B-141
	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
	USN, FNMOC	Navy Coupled Ocean Data Assimilation (NCODA) - Oceanographic	B-117
	Stevens Institute of Technology, CMS/ Davidson Laboratory	New York Harbor Observation and Prediction System (NYHOPS)	B-89
	Oceanweather, Inc.	Global Wind/Wave Analysis and Forecast	B-73
	surflines.com	Models and Buoy Observations	B-93
Oceanographic Observed	SIT, CMS/ Davidson Laboratory	New York Harbor Observing System (NYHOS)	B-91
	UCSD, Scripps	CDIP Wave Buoys	B-139
	Rutgers University, IMCS	Coastal Ocean Observation Lab (COOL)	B-81
	AOOS	Observing System	B-3
	UNCW, CMS	Coastal Ocean Research & Monitoring Program (CORMP) Observing System	B-175
	USC	Observing System	B-179
	NOAA, NESDIS	NCDC Observed Oceanographic	B-41
	NOAA, NESDIS	NDBC Buoys Oceanographic	B-45
	College of William and Mary, VIMS	Observing System	B-13
	UConn, Marine Sciences Department	Long Island Sound Integrated Coastal Observing System (LISICOS)	B-145
	LSU, CSI	Wave-Current-Surge Information System (WAVCIS)	B-29
	SECOORA	North Carolina Coastal Ocean Observing System (NCCOOS)	B-83
	USF, College of Marine Science	Coastal Ocean Modeling and Prediction System (COMPS)	B-193
	WHOI	Martha's Vineyard Coastal Observatory (MVCO) - Oceanographic	B-207
	University of Delaware, CMES	Delaware Bay Observing System (DBOS)	B-149
	FIT, DMES	Observing System	B-17
	NANOOS	Northwest Association of Networked Ocean Observing Systems (NANOOS)	B-71
	USC, Baruch Institute	Carolinas Coast Oceanographic	B-191
	USC, Baruch Institute	Southeast U.S. Atlantic Coastal Ocean Observing System (SEACOOS) Oceanographic	B-183
	USC, Baruch Institute	Carolinas Coastal Ocean Observing and Prediction System (Caro-COOPS) Oceanographic	B-187
	UMCES	Observing System Oceanographic	B-161

Table D-34. Wave maximum height.

Product Type	Provider	Product Name	Page
Oceanographic Modeled	UCSD, Scripps Institution of Oceanography	CDIP Wave Models	B-141
	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
	USN, FNMOC	Navy Coupled Ocean Data Assimilation (NCODA) - Oceanographic	B-117
	SURA	Wave Watch 3	B-87
	Stevens Institute of Technology, CMS/ Davidson Laboratory	New York Harbor Observation and Prediction System (NYHOPS)	B-89
	Oceanweather, Inc.	Global Wind/Wave Analysis and Forecast	B-73
	surflines.com	Models and Buoy Observations	B-93
Oceanographic Observed	SIT, CMS/ Davidson Laboratory	New York Harbor Observing System (NYHOS)	B-91
	UCSD, Scripps	CDIP Wave Buoys	B-139
	Rutgers University, IMCS	Coastal Ocean Observation Lab (COOL)	B-81
	AOOS	Observing System	B-3
	UNCW, CMS	Coastal Ocean Research & Monitoring Program (CORMP) Observing System	B-175
	NOAA, NESDIS	NCDC Observed Oceanographic	B-41
	NOAA, NESDIS	NDBC Buoys Oceanographic	B-45
	College of William and Mary, VIMS	Observing System	B-13
	UConn, Marine Sciences Department	Long Island Sound Integrated Coastal Observing System (LISICOS)	B-145
	LSU, CSI	Wave-Current-Surge Information System (WAVCIS)	B-29
	SECOORA	North Carolina Coastal Ocean Observing System (NCCOOS)	B-83
	UGA, SkIO	South Atlantic Bight Synoptic Offshore Observational Network (SABSOON) Observing System	B-151
	USC, Baruch Institute	Southeast U.S. Atlantic Coastal Ocean Observing System (SEACOOS) Oceanographic	B-183
	UMCES	Observing System Oceanographic	B-161

Table D-35. Wave significant height.

Product Type	Provider	Product Name	Page
Oceanographic Modeled	UCSD, Scripps Institution of Oceanography	CDIP Wave Models	B-141
	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
	USN, FNMOC	Navy Coupled Ocean Data Assimilation (NCODA) - Oceanographic	B-117
	SURA	Wave Watch 3	B-87
	Stevens Institute of Technology, CMS/ Davidson Laboratory	New York Harbor Observation and Prediction System (NYHOPS)	B-89
	Oceanweather, Inc.	Global Wind/Wave Analysis and Forecast	B-73
	surfline.com	Models and Buoy Observations	B-93
Oceanographic Observed	SIT, CMS/ Davidson Laboratory	New York Harbor Observing System (NYHOS)	B-91
	UCSD, Scripps	CDIP Wave Buoys	B-139
	Rutgers University, IMCS	Coastal Ocean Observation Lab (COOL)	B-81
	AOOS	Observing System	B-3
	USC	Observing System	B-179
	NOAA, NESDIS	NCDC Observed Oceanographic	B-41
	NOAA, NESDIS	NDBC Buoys Oceanographic	B-45
	College of William and Mary, VIMS	Observing System	B-13
	UConn, Marine Sciences Department	Long Island Sound Integrated Coastal Observing System (LISICOS)	B-145
	LSU, CSI	Wave-Current-Surge Information System (WAVCIS)	B-29
	SECOORA	North Carolina Coastal Ocean Observing System (NCCOOS)	B-83
	USF, College of Marine Science	Coastal Ocean Modeling and Prediction System (COMPS)	B-193
	UMaine, SMS	Gulf of Maine Ocean Observing System (GoMOOS) Buoys Oceanographic	B-155
	WHOI	Martha's Vineyard Coastal Observatory (MVCO) - Oceanographic	B-207
	FIT, DMES	Observing System	B-17
	USC, Baruch Institute	Carolinas Coast Oceanographic	B-191
	USC, Baruch Institute	Carolinas Coastal Ocean Observing and Prediction System (Caro-COOPS) Oceanographic	B-187
	USC, Baruch Institute	Southeast U.S. Atlantic Coastal Ocean Observing System (SEACOOS) Oceanographic	B-183
	SURA	Interoperability Demonstration Web Site	B-85
	UMCES	Observing System Oceanographic	B-161

Table D-36. Wave peak period.

Product Type	Provider	Product Name	Page
Oceanographic Modeled	UCSD, Scripps	CDIP Wave Models	B-141
	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
	USN, FNMOC	Navy Coupled Ocean Data Assimilation (NCODA) - Oceanographic	B-117
	Stevens Institute of Technology, CMS/ Davidson Laboratory	New York Harbor Observation and Prediction System (NYHOPS)	B-89
	SURA	Wave Watch 3	B-87
	Oceanweather, Inc.	Global Wind/Wave Analysis and Forecast	B-73
	surflines.com	Models and Buoy Observations	B-93
Oceanographic Observed	SIT, CMS/ Davidson Laboratory	New York Harbor Observing System (NYHOS)	B-91
	UCSD, Scripps	CDIP Wave Buoys	B-139
	Rutgers University, IMCS	Coastal Ocean Observation Lab (COOL)	B-81
	AOOS	Observing System	B-3
	USC	Observing System	B-179
	NOAA, NESDIS	NCDC Observed Oceanographic	B-41
	NOAA, NESDIS	NDBC Buoys Oceanographic	B-45
	College of William and Mary, VIMS	Observing System	B-13
	UConn, Marine Sciences Department	Long Island Sound Integrated Coastal Observing System (LISICOS)	B-145
	LSU, CSI	Wave-Current-Surge Information System (WAVCIS)	B-29
	SECOORA	North Carolina Coastal Ocean Observing System (NCCOOS)	B-83
	USF, College of Marine Science	Coastal Ocean Modeling and Prediction System (COMPS)	B-193
	UGA, SkIO	South Atlantic Bight Synoptic Offshore Observational Network (SABSOON) Observing System	B-151
	WHOI	Martha's Vineyard Coastal Observatory (MVCO) - Oceanographic	B-207
	FIT, DMES	Observing System	B-17
	USC, Baruch Institute	Carolinas Coast Oceanographic	B-191
	USC, Baruch Institute	Southeast U.S. Atlantic Coastal Ocean Observing System (SEACOOS) Oceanographic	B-183
	USC, Baruch Institute	Carolinas Coastal Ocean Observing and Prediction System (Caro-COOPS) Oceanographic	B-187
	UMCES	Observing System Oceanographic	B-161

Table D-37. White cap probability.

Product Type	Provider	Product Name	Page
Oceanographic Modeled	UCSD, Scripps	CDIP Wave Models	B-141
	USN, FNMOC	Wave Watch 3 - Regional	B-113
	USN, FNMOC	Wave Watch 3 - Global	B-111
Oceanographic Observed	UCSD, Scripps	CDIP Wave Buoys	B-139
	University of Delaware, CMES	Delaware Bay Observing System (DBOS)	B-149